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CASSELL'S

POPULAR

NATURAL HISTORY.

BIRDS.

I. RAPACIOUS BIRDS.
II. PERCHING BIRDS.
III. CLIMBING BIRDS.
IV. GALLINACEOUS BIRDS.
V. WADING BIRDS.
VI. SWIMMING BIRDS.

VOLUME III.

ILLUSTRATED WITH NEARLY THREE HUNDRED AND FIFTY ENGRAVINGS.

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INTRODUCTION.

NUMEROUS and diversified as are the animals of the Class Mammalia, to which the two preceding Volumes of "Cassell's Popular Natural History" were devoted, it is remarkable that the bat alone is endowed with the power of flight; a flight which is strong, rapid, and marked by sudden evolutions and turns, executed with astonishing celerity.

In the next Class, Aves, which demands our consideration, the body is invariably covered with feathers, and the anterior extremities are organs of flight alone. As the plumage, in its endless modifications, is intimately connected with the habits of the species, these variations are studied by Naturalists, not only as demonstrative of consummate design on the part of the Great Creator, but as an index to the manners of birds, and as a clue to a natural arrangement.

The entire mechanism of the body, indeed, corresponds precisely with the organs of flight. Long and slender, like a snake's, the central point of gravity would have been wanting for maintaining an even, steady course; while, had it been round, there could have been no cleaving of the sky, like that of an arrow in its course. But the body is beautifully boat-shaped; the prow being formed of the small head and pointed beak, and the rudder by the broad, expanded tail; so that the resistance of the air may be effectually overcome. If, too, the plumage and the skin be removed, how fine, how large, how powerful will the muscles appear, expressly destined for the motion of the wings, constituting, as they do, the solid mass of the whole chest, and being more in volume than all the others put together.

The destined tenants of the upper air, birds, borne on rapid wings, transport themselves from place to place, and even from one country to another, with ease and safety. Familiar with the tempest, they rise till lost amidst the clouds; and, from their lofty pinnacle, look down on the outspread earth, with its seas and rivers interspersed on its surface. Yet are they not restricted to the regions of the air; the land and the waters are theirs also; some traversing the fields, some trooping around the dwellings of man, some wading the treacherous morass, some scouring the sandy desert, some living in the umbrageous shade of the sequestered thicket or the lonely forest, and some diving and sporting on the ocean billows.

The appearance of birds is a special attraction to every intelligent observer. As Thomson says:—

"The redbreast pays to trusted man
His annual visit. Half afraid, he first
Against the window beats; then brisk alights
On the warm hearth; then, hopping o'er the floor
Eyes all the smiling family askance,
And pecks, and starts, and wonders where he is;
Till more familiar grown, the table crumbs
Attract his slender feet."

merely as a popular, but a truly valuable auxiliary. Well may we now adopt the genial word of a poet :—

"Ye birds that fly through the fields of air,
What lessons of wisdom and truth ye bear;
Ye would teach our souls from the earth to rise;
Ye would bid us all grovelling scenes despise.
Ye would tell us that all its pursuits are vain,
That pleasure is toil—ambition is pain—
That its bliss is touch'd with a poisoning leaven,
Ye would teach us to fix our aim on heaven.

"Beautiful birds of lightsome wing,
Bright creatures that come with the voice of Spring;
We see you array'd in the hues of the morn,
Yet ye dream not of pride, and ye wist not of scorn!
Though rainbow-splendour around you glows,
Ye vaunt not the beauty which Nature bestows;
Oh! what a lesson for glory are ye,
How ye preach the grace of humility.

"Swift birds, that skim o'er the stormy deep,
Who steadily onward your journey keep,
Who neither for rest nor for slumber stay,
But press still forward, by night or day—
As in your unwearying course ye fly
Beneath the clear and unclouded sky;
Oh! may we, without delay, like you,
The path of duty and right pursue.

"Sweet birds, that breathe the spirit of song,
And surround heaven's gate in melodious throng,
Who rise with the earliest beams of day,
Your morning tribute of thanks to pay,
You remind us that we should likewise raise
The voice of devotion and song of praise;
There's something about you that points on high,
Ye beautiful tenants of earth and sky!"

HILL PARTRIDGES OF CALIFORNIA.

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CASSELL'S
POPULAR NATURAL HISTORY.

BIRDS.

THE illustrious Harvey has said, "Every animal is born from an egg."* At first hearing, this assertion might be doubted, and it might be supposed that eggs are laid only by birds; but it will be found, on limited inquiry, that fishes and reptiles increase their species by eggs also: hence they are said to be *oviparous* animals; the ovum, or egg, being excluded from the body entire, and subsequently hatched.

Eggs, it may be remarked, bear no proportion to the size of the animals that lay them. The living creature is the little whitish circle which may be observed on the membrane that surrounds the yolk, which is the food provided for the animal's support while confined to the shell; and, throughout the range of widely-diversified creatures, there is but very little difference discoverable as to size among these vital atoms. The difference of the eggs arises from the difference in the amount of nourishment required; this amount being strictly regulated according to the size to which it is necessary the young animal should attain before it is launched into the world.

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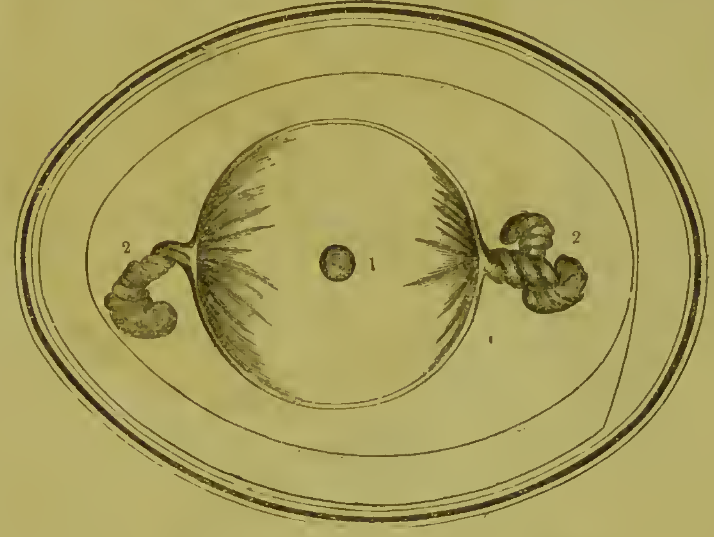
* Omne animal ex ovo.

To make our meaning clear: the crocodile is destined to attain to an enormous growth, and yet its egg is smaller than that of many birds, because its young is able to enter the water and live on its own resources before it is any larger than one of our lizards; there is, therefore, only so much food placed within the shell as will support it until it attains to that size. So, also, in the case of some very large fishes, the eggs are extremely small, because, at a very early age, the young find their subsistence in seas or rivers. But a dog-fish has need of great strength, as it is of great size when it is set at liberty; the egg, therefore, in which it is produced is large, that it may have a longer period for its development.

The eggs of birds are variously tinted and mottled, and, though not in every instance, yet in many, we can certainly see a design in the adaptation of the colours to the purpose of concealment, according to the habits of the various classes of birds. Thus, as a general rule, the eggs of birds which have their nests in dark holes, or which construct nests that almost completely exclude the light, are white; as is also the case with those birds that constantly sit on their eggs, or leave them only for a short time during the night. Eggs of a light-blue or light-green tint will also be found in nests that are otherwise well concealed; while, on the other hand, a great proportion of those nests which are in exposed situations have eggs varying in tints and spots in a remarkable degree, corresponding with the colours of external objects in their immediate neighbourhood. Thus, a dull-green colour is common in most gallinaceous birds that form their nests in grass, and in aquatic birds among green sedges; a brighter green colour is prevalent among birds that nestle among trees and bushes; and a brown-mottled colour is found in those eggs that are deposited among furze, heath, shingle, and gray rocks and stones.



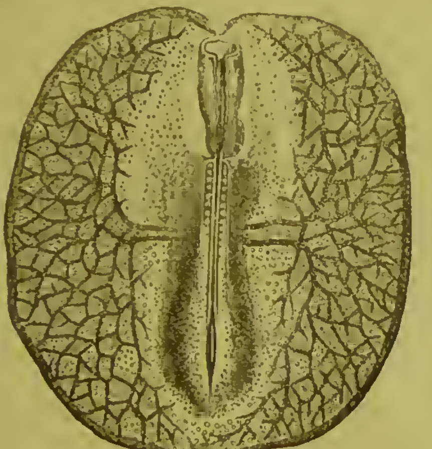
SECTION OF AN EGG READY FOR INCUBATION.

The intensity of the instinct of hatching is well known, since it diverts the animal from one of the strongest—the pursuit of food; while we see the wisdom of the provision, knowing that a steady and high temperature is necessary to bring the offspring to maturity. It is a care added to that of nest-building, both tending to the same end. Yet here, as in the parental affections, there are variations and exceptions. The former are shown in the unequal perseverance of different species, under disturbance or otherwise; as, in the same species, it seems to depend on the personal character of the individual parent, familiarly differing in our domestic fowls, and, perhaps, nearly unknown to us in the wild ones. The exception familiar to us is the cuckoo; and of this anomaly no adequate solution has been offered, since this bird remains with us long enough to rear its own offspring. Yet, even that exception has its interest, as the mode adopted is equally efficacious for its designed end.

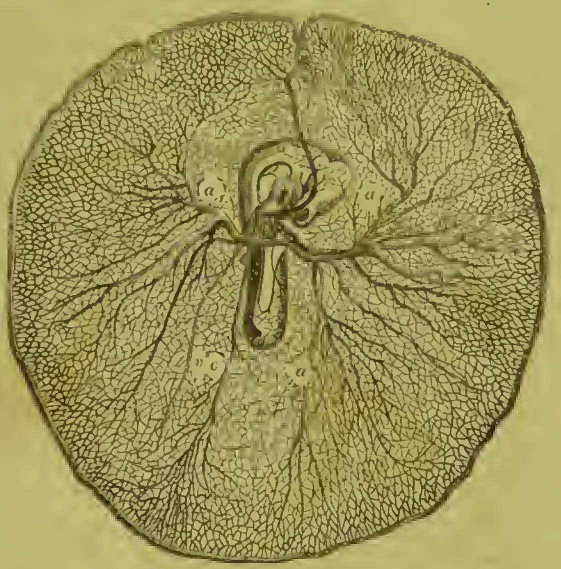
The egg of a bird is beautifully adapted to the process it has to undergo. Thus, its oval form permits a greater part of its surface to be in contact with the warm body of the parent than any other; and within, when an egg is ready for incubation, a small spot may be observed on the yolk (1), which, when examined, is apparently a vesicle, containing fluid matter. In this the embryo swims, and is kept there to the breast of the mother-bird. Nor is this all; for, were its axis through the centre, the embryo would not move with the change in the position of the egg; but the axis being placed below the centre, it must turn round with every such change, whether the yolk be lighter or heavier than the surrounding white. Two dense cords (2), each of them strongly attached to the yolk-bag, pass through the white, and are connected with the inner lining membrane at each end of the egg. A spiral filament runs through each of these cords. There are thus two fixed points on which the yolk can rotate; and the spiral filament, surrounded by thickened albumen, is, by its greater weight, always inclined to its lowest point. And, to perfect this beautiful arrangement, the elasticity of these spiral cords is so nicely adapted to the force with which the yolk is borne up, as to restrain it at a certain point, and allow sufficient space between the yolk and the inner lining of the shell for the white to lubricate the surface of the yolk, and thus to defend the embryo from injury.

Indescribably various are the situations in which the mother-birds pass through this interesting and remarkable process. Our chief knowledge of incubation, however, arises from the attention given to the domestic hen, and some of the results, therefore, we proceed to notice.

A few hours after the hen has brooded over the eggs, a considerable alteration takes place in them. As one of the following engravings will show, the embryo acquires length, and a blood-vessel, issuing from either side, branches into numerous smaller ones, which unite at their termination, and become a boundary on the covering of the yolk. In the centre of this net-work of vessels is the embryo, multiplying as it increases, until they nearly pervade the membrane of the yolk. It appears that when these vessels are first formed, each branch is accompanied by a vessel carrying yolk into the body of the chick, that there may be a due supply for its sustenance and growth.



EARLY CHANGE IN INCUBATION.



THE EGG ON THE THIRD DAY.

The vascular tissue which is to suffice for the primitive circulation, appears in the engraving exhibiting the egg on the third day. It is a circular network, in the centre of which is a bent and palpitating vessel; this is the heart (*a*). The entire network is bounded by the primogenial vein; *v c* is the caudal vein.

This network may be regarded as a lung, which the embryo exhibits above it, and which is found placed in that part of the egg where the oxygen can penetrate most easily—that is, below the air-chamber. It is a simple pulmonary circulation, resembling that of fishes, and lasts about two days. A new circulation then begins; the vascular network, deprived of its principal venous trunks, becomes almost unfit for the process of respiration, but its nutritive functions are more developed.

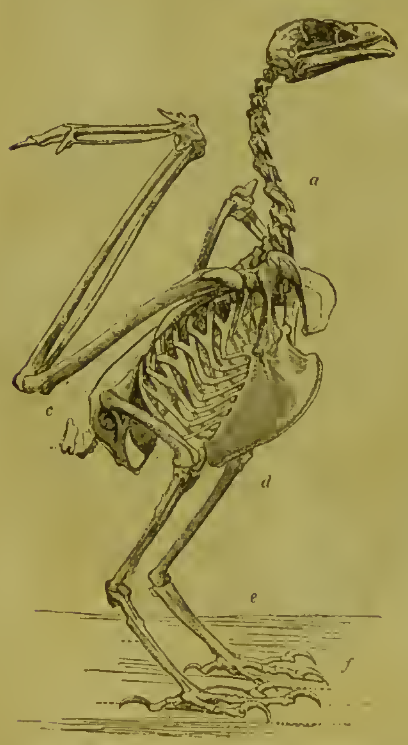
The yolk becomes flattened, and a portion of the white penetrates the yolk-bag. A vesicle is now so far formed as to have passed from the body of the chick to the lining membrane of the shell, and, as the embryo grows, so does this vesicle increase. It is full of blood-vessels—a living system of arteries and veins—carrying livid, red blood from the heart of the chick, and returning it of a bright red colour, perfectly fitted for every purpose it is designed to answer.

Even at the beginning of the third day the beating of the heart is perceptible, though no blood is visible. But only a few hours elapse, and two vesicles, containing blood, appear, one forming the left ventricle, the other the great artery. The auricle of the heart may now be observed; and the writer will never forget the pleasure with which he first saw an egg at this stage of developing the chick, exhibiting, as it did, the course of the blood to the unassisted eye.

About the sixth day, the bare wings and legs of the chick may be fully seen. The eyes are large and prominent; the brain begins to acquire consistence; and, a little later, the beak opens for the first time. The additional growth of a few days shows the wings and the body covered with short feathers; and that which was a little time before a shapeless mass, has now form and proportion. If an egg be opened between the twelfth and thirteenth days, the pulses of the numerous blood-vessels will be seen propelling onwards their contents, and thus presenting a very remarkable and beautiful spectacle.

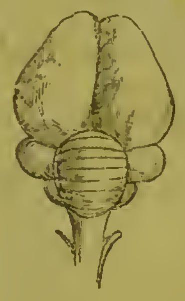
As, on the eighteenth day, the faint piping of the little tenant of the shell is heard, respiration has already taken place. The vesicle, which had increased with the growth of the embryo, has continued to enlarge over the surface of the membrane of the shell, which it now entirely surrounds, thus forming an external covering to the yolk. The large blood-vessels which connect the chick with this membrane —any one of which, if left open, would prove fatal to the bird—begin to be sealed and shrink, and preparation is made for its escape.

On the twenty-first day, the little bird—disengaged from all its protecting membranes, which have become dried up, already accustomed to pulmonary respiration, and with its first necessities provided for by the remainder of the yolk being drawn into the body — is ready to leave the shell. With its beak armed with carbonate of lime, it makes a line on the inner surface, thus preparing it for fracture; and, by repeated pushings of the body, it gradually raises the upper portion of the cell, and thus effects its escape.



a Cervical Vertebræ. *c* Thigh Bone. *d* Tibia. *e* Tarsus. *f* Toes.

SKELETON OF A BIRD.



BRAIN OF A BIRD.

The first peculiarity which strikes an observer, when comparing the skulls of birds with those of mammals, is the absence of sutures in the former, the proper cranial bones being consolidated into one piece. The skull is articulated to that part of the vertebral column called the neck by a single condyle, or joint, which is situated at the front margin of the great occipital opening,* through which the brain, becoming elongated, as it were, into the spinal cord, descends into the vertebral column. The following scale has been given as an example of the size of the brain in relation to that of the body:—Eagle, 1-260th; Sparrow, 1-25th; Blackbird, 1-68th; Duck, 1-257th; Goose, 1-360th; Man, 1-22nd to 1-33rd of the body.

It is this beautiful adaptation of structure to the wants of the animal that gives such a freedom of motion to the head, especially in a horizontal direction. The wryneck,† for example—as those who have surprised the bird in the nest will readily admit—can writhe her head round so as to look the intruder in the face, hissing all the while like a snake; and, by this "terrible show," many a bird's-nesting novice is frightened away. The number of cervical vertebræ is generally very considerable. In the mammalia there are seven, but in birds there are twice that number; and in the swan there are twenty-three.

The skeleton of birds has the same constituent parts as that of other vertebrated classes. The bones of the anterior extremity, though destined exclusively to support the wing, retain the same divisions, and are composed of the usual elements. The general form of the body is the one best calculated to glide with the least resistance through the air. As birds swallow their food entire, they need no hard and solid teeth, nor the large muscles and heavy jaws, which are required by most quadrupeds: hence, the head is greatly reduced in size, whilst the pointed beak cuts the opposing air, and aids the progress of the bird in its flight. In birds the ribs, and the viscera which they protect, are placed as far back along the spinal column as possible; and a long and flexible neck extends from the trunk to the head, which is thus carried considerably forwards.

The inferior limbs consist of the thigh-bone or *femur* (*c*), which lies close to the body enveloped

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* Foramen magnum.

† Yunx torquilla.

GENERAL GROUP OF BIRDS.

in muscles, covered with the skin, and concealed beneath the feathers. The next part is the *tibia* (*d*), consisting of a single elongated bone, and to this succeeds the *tarsus* (*e*), covered only with scaly skin, having the toes articulated to the extremity. In most birds, the toes (*f*) are three before and one behind, but here great variety prevails.

A man would soon be tired who was accustomed to stand on stilts, but a stork does this without any fatigue. This bird, like others, has a provision, by which the legs are kept extended without any exertion of the muscles, in the manner of curtain strings—a structure which enables it to pass whole days and nights on one foot, without the slightest weariness. If the cook be visited the next time she trusses a fowl, the nature and utility of this structure will be seen at once. On bending the legs and thighs up towards the body, it will be observed that the claws close of their own accord : now, this is the position of the limbs in which the bird rests upon its perch, and in this position it sleeps in safety ; for the claws do their office in keeping hold of the support, not by any voluntary exertion, but by the weight of the body drawing the strings tight.

In the structure of the body, also, we discover all that could contribute to give it lightness. The general size of birds is considerably smaller than quadrupeds of corresponding habits. Pegasus, that winged steed which sprang forth from the neck of Medusa, after her head had been severed by Perseus, and, flying upwards, fixed his abode on Mount Helicon, is the offspring of imagination alone, and, for anatomical reasons, never could have had a real existence. Great condensation has been given to the osseous substance in birds ; ossification, indeed, not only proceeds more rapidly, but is also carried to a greater extent in birds than in any other animals ; as a proof of which the tendons, especially those of the muscles of the legs, are frequently ossified. Thus it is ordered that the greatest degree of strength might be procured with the same weight of solid materials ; and the mechanical advantage derived from their being disposed in the circumference, rather than in central masses, might be most fully obtained.

In like manner, the horny material of which the feathers are composed are formed into hollow cylinders, which, compared with their weight, are exceedingly strong. A similar shape has been given to the cylindrical bones, which are fashioned into tubes with dense but thin sides. Most of the other bones have likewise been made hollow, and they contain only air. No provision of this kind appears in the bat, winged as it is, for lightening the bones ; they, too, contain marrow, as in other mammalia, and not air. Thus, in the case of birds, the whole skeleton is rendered remarkably light ; that of the white pelican,* for instance, which is five feet in length, was found by the Parisian Academicians to weigh only twenty-three ounces, while the entire bird weighed nearly twenty-five pounds. The cavities in the bones communicate with large air cells, which are distributed in various parts of the body, and which contribute still further to diminish its specific gravity ; and, by means of canals which open into the air passages of the lungs, this air finds a ready outlet, when it becomes rarefied by the ascent of the bird into the higher regions of the atmosphere.

In these creatures alone we find a perfect adaptation of structure to the purposes of rapid and extensive flight. The frame of the skeleton, the figure, position, and structure of the wings, the size of the muscles, their peculiar irritability, and even the outward form of the feathered tribes, have a direct and beautiful relation to the element in which they are designed by the Great Creator to move. Thus, in their formation, a new, and, in so far as relates to the organs of progressive motion, a more developed type is adopted, but still preserving a conformity with the general plan of the vertebral organisation, and with the general laws of its development.

That the body may be exactly balanced while the bird is flying, its centre of gravity must be brought precisely under the line connecting the articulations of the wings with the trunk ; for it is at these points that the resistance of the air causes it to be supported by the wings. When the bird is resting on its legs, the centre of gravity must, in like manner, be brought immediately over the base of support formed by the toes : it becomes necessary, therefore, to provide means for shifting the centre of gravity from one place to another, according to circumstances, and for adjusting its position with considerable nicety ; otherwise there would be danger of the equilibrium being destroyed, and the body upsetting.

The principal means of effecting these adjustments consist in the motions of the head and neck, which last is, for that purpose, rendered exceedingly long and flexible. The cervical vertebræ are joined together by articulations, generally allowing free motion in all directions; that is, laterally, as well as forwards and backwards. This unusual degree of mobility is conferred by a peculiar mechanism, which is not met with in the other classes of vertebrated animals. A cartilage is interposed between each of the vertebræ, to the surfaces of which these cartilages are curiously adapted, being inclosed between folds of the membrane lining the joint; so that each joint is, in reality, double, consisting of two cavities, with an intervening cartilage.

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* Pelicanus onocrotalus.

It should be observed, however, that, in consequence of the position of the oblique processes, the upper vertebræ of the neck bend with more facility forwards than backwards, while those in the lower half of the neck bend more readily backwards; hence, in a state of repose, the neck naturally assumes a double curvature, like that of the letter S, as is well seen in the graceful form of the swan's neck. By extending the neck in a straight line, the bird can, while flying, carry forwards the centre of gravity, so as to bring it under the wings; and when resting on its feet, or floating on the water, it can transfer that centre backwards, so as to bring it towards the middle of the body, by merely bending back the neck into the curved form which has just been described, and thus the equilibrium is, under all circumstances, preserved by movements remarkable for their elegance and grace. The great mobility of the neck, too, enables the bird to employ its beak as an organ of prehension for taking its food—an object which was more necessary, in consequence of the conversion of the fore extremities into wings, of which the structure is incompatible with any prehensile power, such as is often possessed by the anterior extremity of a quadruped.

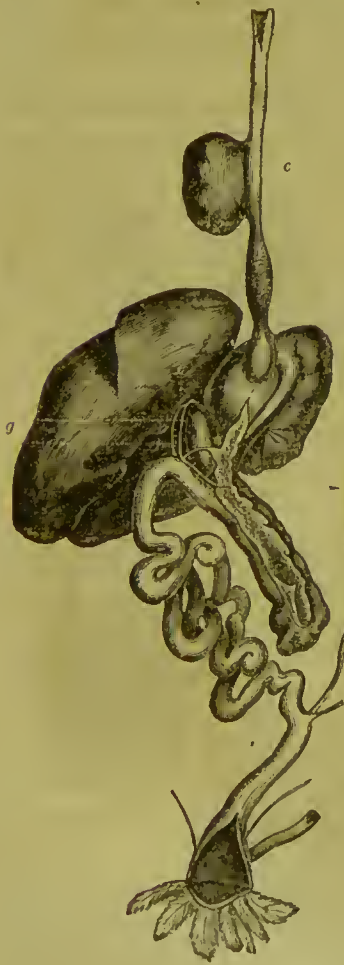
Another advantage arising from the length and mobility of the neck is, that it facilitates the application of the head to every part of the surface of the body. Birds require this power, in order that they may be able to adjust their plumage, whenever it has, by any accident, become ruffled. In aquatic birds, it is necessary that every feather should be constantly anointed with an oily secretion, which preserves it from being wetted, and which is copiously provided for that purpose by glands situated near the tail. The flexibility of the neck alone would have been insufficient for enabling the bird to bring its bill in contact with every feather, in order to distribute this fluid equally over them; and there is, accordingly, a further provision made for the accomplishment of this object in the mode of articulation of the head with the neck. In fishes and in most reptiles this articulation consists of a ball and socket-joint, a rounded tubercle of the occipital bone being received into a hemispherical depression in the first vertebra of the neck. In the mammalia, the plan is changed, and there are two articular surfaces, one on each side of the spinal canal, formed on processes corresponding to the leaves of the first cranial vertebra, and assimilating it more to a hinge-joint. In birds, however, where, as we have just seen, the most extensive lateral motions are required, the plan of the ball and socket-joint is again resorted to, and the occipital bone is made to turn upon the atlas by a single pivot. So great is the freedom of motion in this joint, that the bird can readily turn its head completely on its back, on either side.

THE STERNUM, OR BREAST-BONE.

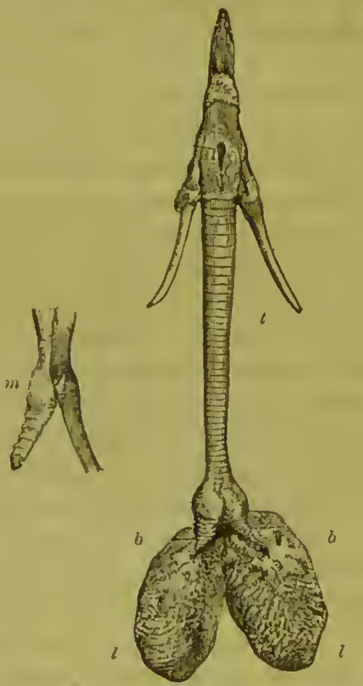
As spinous or transverse processes of any length would have interfered with the flexions of the neck, we find scarcely a trace of them in the cervical vertebræ of birds. The spinal marrow passes down along the canal formed by the arches of the vertebræ, and any pressure applied to its tender substance would instantly paralyse the whole body, and speedily put an end to life. Some extraordinary provision was therefore required, in order to guard against the possibility of this accident occurring during the many violent contortions into which the body is liable to be thrown. This is accomplished, most simply and effectually, by enlarging the diameter of the canal at the upper and lower part of each vertebra, while, at the middle, it remains of the usual size, so that the shape of the cavity of one of the cervical vertebræ of the ostrich, for instance, resembles that of an hour-glass. Thus, a wide space is left at the junction of each successive vertebra, allowing of very considerable flexion, without reducing the diameter of the canal beyond that of the narrow portion, and therefore without compressing the spinal marrow. It has been found that vertebræ united in this manner may be bent backwards to a right angle, and laterally to half a right angle, without injury to the inclosed nervous substance. The design of this structure is further evident from its not existing in the dorsal and lumbar portions of the spine, which admit of no motion whatever, and where there is no variation in the diameter of the spinal canal.

The sternum, or breast-bone, is of enormous size, extending over a considerable part of the abdomen, and having a large perpendicular crest descending, like the keel of a ship, from its lower surface. The object of this great development is to furnish extensive attachment to the large pectoral muscles employed to move the wings, and which, taken together, are generally heavier than the rest of the body. Considered with reference to all the other muscles, and to the weight of the body itself, these pectoral muscles are of enormous strength. The flap of a swan's wing is capable of breaking a man's leg, and a similar blow from an eagle has been known to be instantly fatal.

The scapular is, generally, a small and slender bone. The coracoid bone is largely developed, and assumes much of the appearance of a clavicle. But the real clavicles are united below, where they join the fore part of the sternum, appearing as one bone, which, from its forked shape, has been called the *furcular* bone. In the fowl, it is commonly known by the name of the *merry-thought.* This bone, placed at the origin of the wings, and stretching from one to the other, is of great importance, as constituting a firm basis for their support, and for securing their steadiness of action; and being, at the same time, very elastic, it tends to restore them to their proper situations, after they have been disturbed by any violent impulse.



c The Crop. *g* The Gizzard.
DIGESTIVE APPARATUS OF A CHICKEN.

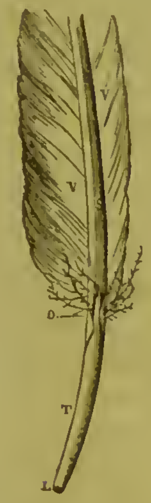


t Trachea. *b b* Bronchial Tubes. *l l* Lungs. *m* Crescent-shaped Membrane, surmounting a piece of bone lying across.
ORGANS OF RESPIRATION AND VOICE.

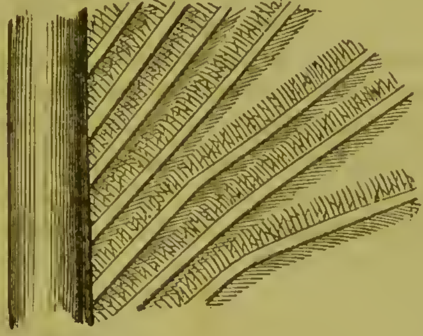
If a feather be carefully examined, it will be found composed of three primary parts: the quill, the shaft, and the vane. These, with the subordinate parts, are exhibited in the following figures:—In (S) appears the posterior surface of the solid stem, divided into two parts by a longitudinal groove, and from either side of which proceeds a series of laminæ, composing, with the fibrils, what is termed the vane (V). The lines from which the laminæ arise approach one another at the lower part of the stem till they meet at a point. Here the groove terminates, and there is a small orifice (O) leading to the interior of the quill. From this part the transparent, tubular portion of the quill (T) commences; and at its lower extremity (L) there exists a second, or lower orifice.

The growth of a feather is exceedingly curious. When a bird leaves the egg, it is covered, except on the under side, with a downy kind of hair. On examining its little garment closely, several little tufts, of ten or twelve hairs each, will be observed, resembling the fibres of a camel-hair pencil. Each tuft grows from a bulbous root in the skin, just as the parts of the future flower arise from the round root of the tulip or crocus. Commonly, the first robe of down soon falls off; but, in the eagle and other rapacious birds, the tufts adhere for a considerable time to the feathers.

While the down remains, a marvellous apparatus is being formed, which may be called a feather manufactory, for a mould is made for every feather. When first visible, this organ has the form of a very minute capsule (B), which rises above the cuticle, and is attached by a filament proceeding from its base to one of the papillæ of the skin, thus establishing its connection with the living system. In a few days this cone has become a cylinder (Fig. 1) with a pointed extremity (A), while its base (B) is united to the true skin by a more distinct bond of connection, formed by the enlarged vessels, which are supplying it with nourishment.



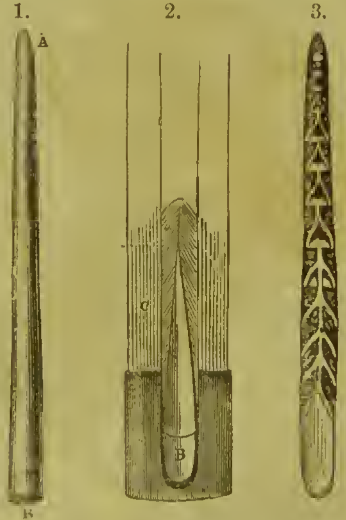
THE FEATHER.



FIBRILS OF A FEATHER.

LAMINÆ INTERLACED.

At the time, too, in which the outer covering of the shaft is growing in one place, the spongy substance is deposited in others. The parts which form the vane of the feather are, however, produced first. They do not grow from the base, like hairs from the head, for all the materials composing the fibres are cast into moulds, where they harden, and acquire their exact shape. The smaller parts, called fibrils, are probably formed in moulds still more minute.



1. Productive Capsule, A, B. 2. Capsule opened. Outer Capsule, C. Pulpy Mass, B 3. Conical-shaped Membrane, as the stem is filled up.

THE GROWTH OF A FEATHER.

As the parts of a feather thus advance below, those which are completely formed rise above the skin, carefully covered, however, for a short time; after this they unfold, and assume their proper shape. On the feather being perfected, the substance which forms it dries up, the blood-vessels which nourish it disappear, and thus we have the pith, which is removed before making a pen. Geese are sometimes plucked too soon, the feathers being still young; hence the soft barrel is gorged with blood.

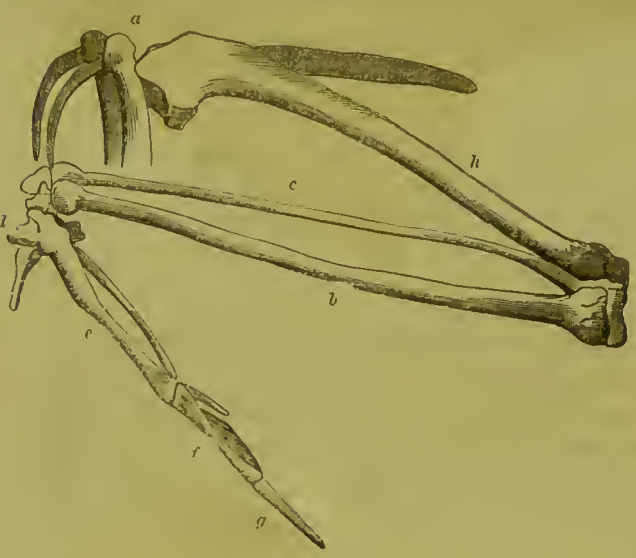
Marvellous as all this is, it should be observed that this feather manufactory is not merely in action once during the life of a bird; for all its feathers are generally moulted annually, and even at shorter periods. A new mould must, therefore, be produced every time a new feather is formed.

"Light as a feather," has long been a proverb; but a feather is also remarkable for its strength. In the upper part of the shaft is a material, used in no other class of animals, and, indeed, in no other part of birds. As the pith is neither bone nor flesh, membrane nor tendon, it is a very peculiar substance, and, like the former, it is made and used for one special purpose. The quill is partly composed of circular fibres, which must be scraped off in making a pen, or else it will split roughly, and make what boys call "cat's teeth." This part serves as a sheath while the feather issues from the skin, and during its future growth.

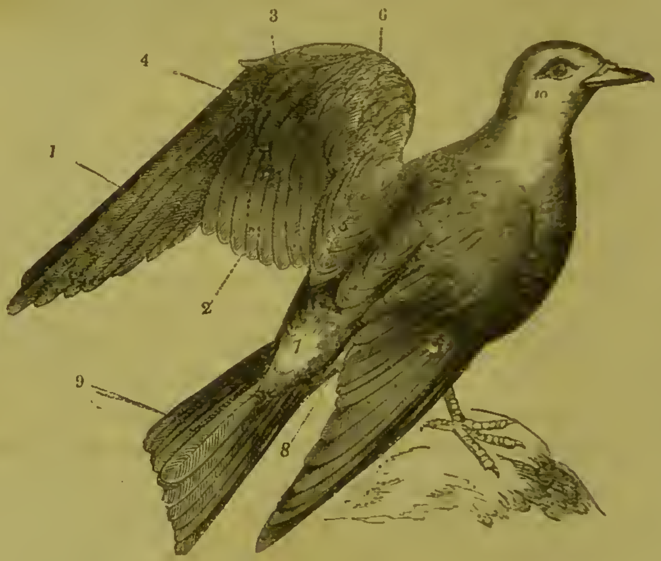
The shaft will be found divided into two portions by a long groove, and from each side proceed the parts which form the vane (V). One of these is usually stripped off in making a pen. The vane is formed to oppose proper resistance to the air. Rub the feather up and down in the line of the stem, and no difficulty will arise; but press it in the direction of its greatest width, and it will resist the effort. Now, the impulse of the air occurs just where the feather does not yield; here, therefore, it wants strength, and here it has it.

The resistance thus presented arises from a number of fibres, on the margins of which, as the microscope shows, there are fibrils, fitted to unite together, a thousand of which have been counted in the space of an inch. (See cut, page 9.) They are of two kinds: one branched, or tufted, and bending downwards; the others, not divided into branches, but directed upwards. They act like the fingers when the hands are clasped together. The interlacing of these fibrils causes the close texture of the vane. When they are separated by accident or force, and are brought together again, they reunite at once, and the vane is as firm and smooth as it was before. If the finger be drawn down the feather, against the grain, perhaps some of the fibrils will be broken off; but, if it be drawn the other way, all of them will appear in order.

The part of the plumage first wanted is always the earliest produced. Thus, when wings are not needed so soon as clothing, the coat of down precedes the pinions. A young partridge, for instance, is no sooner hatched than it runs off to pick up the chrysalis of the ant, which the parent scratches up for her brood; hence, from the first, the body is defended by a close-set downy covering, while all the strength of the bird is given to the thighs, legs, neck, and bill—the parts actually in use. It is not necessary that the partridge should fly for some time, and therefore the wings are afterwards gradually formed. Not so is it with the young blackbird or thrush: this bird must fly as soon as it leaves the nest; and hence, while its body shows only a few scattered bunches of weak, downy, hair-like feathers, the quills and other wing-feathers are very rapidly formed.



BONES OF THE WING.



FEATHERS OF A BIRD.

The plumage of the male bird is generally far more brilliant than that of the hen; and, when it is so, the young always put on first the plainer dress of the mother. When there is little difference between the two, the young have a particular and distinguishing attire of their own.

Colour is intended not merely for beauty; it is, in fact, a mode of concealment, the most universal of all means of defence, and one that appears in every race of animals. As the strength, the weapons, and the velocity are all on the side of the pursuer, colour is much more resorted to for the defence of birds than of any other creatures. In the partridge, the quail, the woodcock, and the snipe, the likeness of their colours to the brown earth on which they move is such as often to conceal them from every eye, not excepting the piercing sight of the hawk or the kite. The hovering foe may be observed above during the chase, though the victim has not escaped, deceived also by smaller birds, even when the accordance in colour is not great. Often do they shift their position under the eye of a hawk eager to pounce upon them, and then stop, as if, as White says, "they knew the colour of the spot on which they are cowering and squatting was a sure defence."

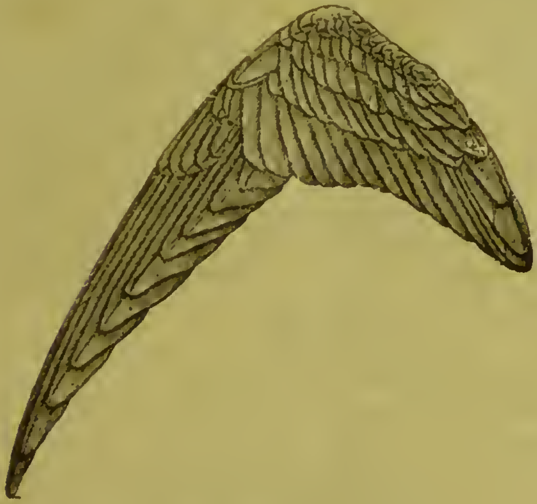
Of this there is a special instance when the males are provided with the most beautiful plumage, while the females are attired in a dull, earthy colour, so that they can scarcely be distinguished from the ground on which they sit. This difference particularly appears in the pheasant, peacock, and duck tribes.

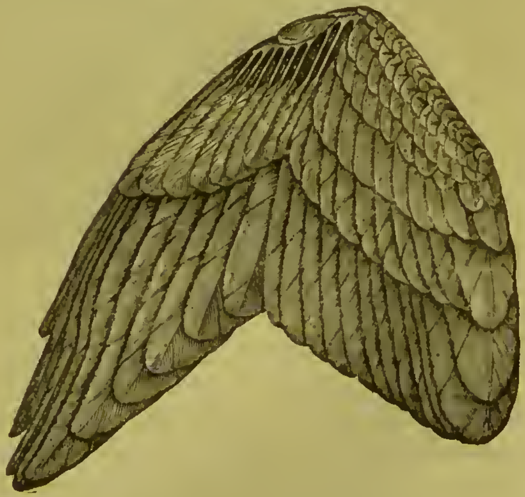
In the wings there is an osseous framework, acted upon by muscles, the tendons of which are respectively inserted into the several bones composing it, the whole being covered with skin, and affording a solid basis, on which the feathers rest. The wing, which is, in fact, the arm of the bird, consists, as in man, of the true arm, the fore arm, and the hand.

The true arm is formed of the *humerus* (*h*), a cylindrical and hollow bone, the head of which is received into a shallow cavity of the *scapula*, or shoulder-blade (*a*), at the angle made by the sudden turn and descent of the large *coracoid* process, which is attached at its posterior extremity to the anterior margin of the breast-bone. The fore arm consists of an *ulna* (*b*), and a *radius* (*c*), which is very slender. The ulna has often a row of tubercles on the upper surface, denoting the situation of the barrels of the secondary quill feathers, to which it yields support. The hand is divided, as usual, into *carpus* (*d*), *metacarpus* (*e*), and *phalanges ;* but, so far from being flexible, as the name suggests, it is a firm, inflexible basis for a series of stiff, elastic feathers, continuous with those proceeding from the ulna. On the anterior edge, and at the base of the metacarpus, is seated the thumb bone, a single-jointed piece (*f*). The fingers (*g*) are two : the first consists of two phalanges, a broad basal bone, as if several were compacted into one, and a small pointed bone. The second finger consists merely of a small portion in close contact with the first phalanx of the first finger. The hand, thus formed, is as perfectly adapted to its circumstances as the hand in man, to which it bears, however, only a slight resemblance.

WING OF A BIRD.

The feathers arising from the hand and ulna are termed quill feathers, and are divided into two sets. One arises from the hand, consisting of the most important of the series, and chiefly instrumental, by their length and shape, their stiffness or flexibility, in determining the character or power of flight. These are the *primary quill-feathers* (No. 1) : they are ten in number, but differ in form as well as relative length. The other set arise exclusively from the ulna, and are the *secondary quill-feathers* (No. 2) ; they are usually shorter, broader, and less rigid than the former, and the number varies. From the small bone which represents the thumb arise certain short, stiff feathers, lying close on the quills of the primaries, and constituting the *winglet*, or spurious wing (No. 3). There is also a group of feathers termed *tertiaries*, arising from the humeral joint of the fore arm, and which, in many birds,


ACUTE WING OF A FALCON.


OBTUSE WING OF A BUZZARD.

as the curlew, plover, lapwing, &c., are very long, and form a pointed appendage very apparent during flight. In most birds, however, they are not to be distinguished from the rest of the *greater coverts* (No. 4), of which they are, in fact, a continuation. Other feathers, attached to the upper part of the *humerus*, lie along the sides of the back, and in many birds they are of great length; they are called *scapularies* (No. 5.)

A series of feathers, termed the *lesser coverts* (No. 6), are disposed in scale-like order, row after row, on the fore arm and carpal joint. The quills of the tail-feathers are hidden beneath the *upper tail coverts* (No. 7). Beneath are the *under tail coverts* (No. 8). A tuft of feathers form the *ear coverts* (No. 10), and the tail (No. 9), has only to be mentioned to complete a general view of the plumage of birds.

SUB-ACUTE WING OF THE GOAT-SUCKER.

When the longest feathers occupy the edge side of the wing, and then go on decreasing, the wing is *acute;* when the longest feathers correspond with the middle of the hand, the wing is *obtuse.* Each of these types may offer three cases: when the second feather of the wing, beginning from the edge, is the longest, the wing is simply *acute;* when the first feather is as long, or longer, than the others, the wing is *sur-acute;* when the third feather is equal to the second, the wing is *sub-acute.* In like manner, three degrees have been established in the obtuse wing: if it is on the fourth feather, which is the longest, it is simply *obtuse;* if it is the third, it is *sub-obtuse;* if it is the fifth, or following, it is *sur-obtuse.* The bird with acute wings moves with greater agility than the one whose wings are obtuse; hence, the one has been called a *sailing* bird, and the other a *rowing* bird.

One of the laws of motion is, that action and reaction are equal—that is to say, that whenever one body exerts a force on another, the second body opposes the first, with equal force, in an opposite direction. When, for instance, a boy runs with his kite against the wind, he strikes the air, and thus produces a reaction, which is equal to the force given to it. When the wind is high, and its action is not intercepted by surrounding objects, there cannot exist any necessity for such an expedient.

In like manner, if a bird strikes the air below it with a force which is equal to its weight, then must there be a reaction of the air, upwards, exactly equal to it; and the bird, being acted on by two equal forces, in opposite directions, will, necessarily, rest between them. But as the force of the stroke is greater than the weight of the bird, it therefore rises with the difference of these forces; were the stroke less than its weight, then would it sink with the difference. If, for example, a bird weighs *twelve* ounces, and it strikes the air with a force equal to *sixteen*, it must *rise* with a force equal to *four;* and if it strikes the air with a force equal only to *eight*, it is equally clear that it must *sink* with a force equal to *four.*

SUB-OBTUSE WING OF THE CUCKOO.

SUB-OBTUSE WING OF THE JAY.

The flight of birds is, sometimes, very extraordinary. M. Adamson caught swallows on the coast of Senegal, which arrived there eight or nine days after their departure from Europe. A falcon, eagerly pursuing a smaller bustard at Fontainebleau, was taken the following day at Malta, being recognised by the ring she bore. And to mention only one more instance: at Barbadoes, the sea-gulls proceed in flocks to a distance of more than two hundred miles, and return again the same day!

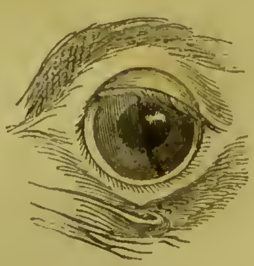
The tail of a bird differs, in its action and uses, from the rudder of a ship. The rudder, for example, is so fixed that it can only move in one horizontal plane, and can therefore only turn the vessel to the right or left, which, indeed, is all that is required; but the tail of a bird, in addition to this motion, can be placed in a diagonal direction, and, when expanded, will offer a considerable surface to the air, so as to fulfil some of the offices of a third wing. If, for instance, a rook be watched as he gambols through the air, it will be seen that, after flying in the ordinary way, his wings are at rest, and that he glides along without the least exertion in his descent. In this case his expanded wings act as a parachute; then, again, he will be observed wheeling round—a manœuvre which is partly produced by the oblique position of his tail. The tail, too, serves to poise the body of the bird.

SUB-ACUTE WING OF THE SEA SWALLOW.

FEATHERS OF THE TAIL.

The wings are used to direct the bird in its course, and the tail acts as a supplementary organ. Thus, it is evident that it can easily turn, either to the right or left, by flapping the opposite wing with increased force, just as a boat is turned about to the right, by a brisk application of the left oar. And hence, the more rapid the flight is forward, the greater is the difficulty of one wing surpassing the other in velocity; and less sudden are the deviations. This is the reason why the birds which fly with the greatest velocity make large circuits in turning. In like manner, the irregular flight of the butterfly, now up and now down, now to the right and now to the left, is, probably, effected by the wings striking the air one after the other, or, perhaps, with an alternate and unequal force. The object of such an action is to baffle the pursuit of birds which fly in a right line, whereas the butterfly does just the contrary.

Of the five senses, sight, smell, and hearing are the most acute in birds. To begin with the first: the bony orbits are of great magnitude, and the organs of vision contained in them are proportionably large. In the birds of prey, "the orbits have the shape of a chalice," says Blumenbach, "or cup used in the communion service. The *cornea,* which is very convex, forms the bottom of the cup, and the posterior segment of the *sclerotica* resembles its cover. This peculiar form arises from the curvature and length of the bony plates, which, as in all other birds, occupy the front of the sclerotica, lying close together, and overlapping each other. These bony plates form, in general, a flat or slightly convex ring; being long and curved, as in the hawk, they form a concave ring, which gives the whole eyeball the above-mentioned form." By means of this ring, the eye becomes a kind of self-adjusting telescope, so as to take in both near and very distant objects.



NICTITATING MEMBRANE.

The *crystalline humour* is flat in birds, and the *vitreous humour* is very small. The colour of the *iris* varies in different species, and in many cases is very brilliant. They have three eyelids, two of which, the upper and the lower, are closed, in most of the race—as may be seen in our domestic poultry—by the elevation of the lower one. The owl, the goat-sucker, and a few others, have the power of depressing the upper eyelid. Of these birds, the upper only is furnished with eyelashes generally. The ostrich, secretary vulture, some parrots, and a few other birds, have them on both lids. But the third eyelid, or nictitating membrane, forms the most curious apparatus. When at rest, this, which is a thin, semi-transparent fold of the *tunica conjunctiva*, lies in the inner corner of the eye, with its lower edge nearly vertical. By the combined action of two muscles which are attached towards the back of the sclerotica, it is capable of being drawn out so as to cover the whole front of the eyeball like a curtain, while its own elasticity restores it to the corner in which it rested. This, it is said, enables the eagle to look at the sun.

The sense of hearing appears to be sufficiently acute in birds, though, with the exception of the night-birds, the owl in particular, they have no external cartilaginous ear; and the peculiar valve, partly muscular and partly membranous, placed at the ordinary opening, even in those birds, has none of the development which generally marks the *concha* of mammals. The peculiar arrangement of the comparatively loosely-barbed feathers, however, round the aperture* compensates for it; and this arrangement may be well seen in the rapacious birds.

The sense of smelling, highly developed in the majority of birds, was supposed to have reached its highest power in the vultures. But some doubt, as we shall see hereafter, has been cast on this supposition.

Though all birds possess a tongue, it is probable that but few find enjoyment in it as ministering to their taste, and in those few it is thick, soft, and covered with *papillæ.* In general, the tongue is horny and stiff; but, as an organ for taking food, it becomes of the highest importance. The sense of touch, as applied to external objects, must, generally speaking, be very obtuse.

Perhaps the most interesting display of the instinctive affections of birds appears in the education of their offspring. The transition between the repose of the nest and flying is very great; and, even after their escape, the young, yet feeble, are not capable of finding sufficient food. Thus the parental cares are still exerted in teaching their young how to fly; and it is pleasant to watch this course of instruction in the swallow, and others which build high above the ground. He who has the opportunity must be a careless observer of nature who has not witnessed the gradually diminishing dependence of the offspring, after this great change, in the beseechings and the caresses which solicit food, sometimes granted and at others refused, till the link is broken, and the passion implanted for this great purpose ceases to act; when the new animal at length takes its independent place in the great society, to labour, in no long time, and in like manner, for a posterity, as it has been a cause of care and labour to its parents.

Cuvier has placed the Birds of all known regions in Six Orders; and hence, slightly departing from the details of his arrangement, we shall now proceed to consider them as follows :—

ORDER I. THE RAPACIOUS BIRDS.
,, II. THE PERCHING BIRDS.
,, III. THE CLIMBING BIRDS.

ORDER IV. THE GALLINACEOUS BIRDS.
,, V. THE WADING BIRDS.
,, VI. THE SWIMMING BIRDS.

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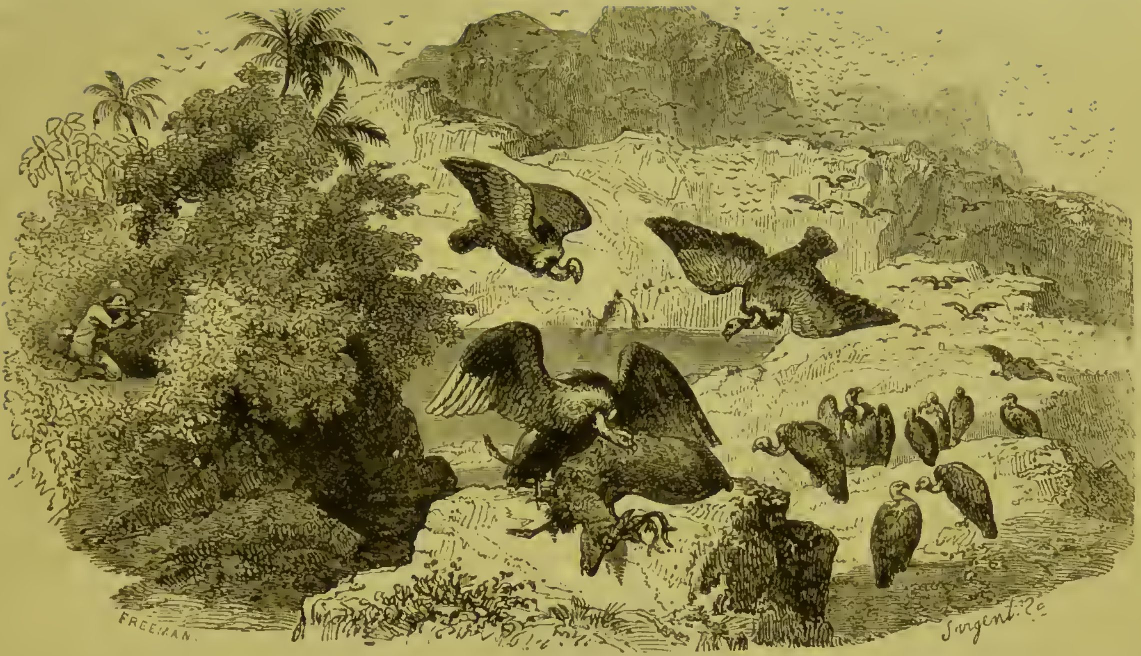
* Meatus auditorius.



RAPACIOUS BIRDS.[*]

No portion of the world is without raptorial animals, and, according to the all-wise constitution established by the Creator, no other system could long exist, except that which operated as a salutary check on the production of, and as balance of power between, all creatures.

The first Family of raptorial birds that demands our consideration is one[†] whose geographical distribution is confined to warm climates. The genus *Vultur*, of Linnæus, stands first in his first order *Accipitres*, and consists of the following species:—*V. gryphus; V. harpyja; V. papa; V. monachus; V. aura; V. barbatus; V. percnopterus*, and *V. albicilla*. Cuvier divides the genus *Vultur* into the following sub-genera:—*Sarcoramphus; Cathartes; Percnopterus;* including the Urubu, *Vultur Jota* of C. Bonaparte, and the Griffons. Other arrangements have also been proposed, into which it is needless to enter; attaching, as we shall do, the assigned technicality to each one of the more remarkable birds of the family, which will be described as popularly as possible.

It has often been remarked that the carnivorous animals and rapacious birds are strikingly typified by each other. In the principal forms of each order there are the strongest creatures in existence, and both are generally of a large size. Their dispositions are fierce and daring, and the whole frame is specially adapted to powerful action and swift pursuit. The sight is remarkably acute; and, as we draw out or push in the tube of a telescope, as the distance of the object is greater or smaller, so there is a similar power over the lenses of the eye, that the rapacious bird may discern from its towering height the prey far beneath, and see it with no less distinctness as it descends to the spoil. In some groups, vision is particularly acute by night, and in these the hearing is also delicate. The organs of mastication are fitted for tearing, as may be seen in the powerful canines of some, and the strong and toothed bills of others. The claws are large, curved, sharp, and retractile.

If it be affirmed that the parallels drawn by some naturalists between mammalia and birds are overstrained and visionary, it may be asserted that there are some instances in which they are truly indicated by nature. This analogy is, perhaps, in no instance better established than between the vultures and the hyæna, jackal, or wolf. Alike scavengers of the earth, they remove its offal, and they clear away its dead, which would otherwise corrupt the air with pestilential exhalations.

[*] Accipitres.

[†] Vulturidæ.

Far less ferocious, however, are the vultures than the analogous quadrupeds. The latter attack living prey, thirsting for blood, while the former batten on the carcases of the dead, and rarely make the living their victims. Happily for them, they are seldom at a loss for a meal in the countries where they abound. If the unburied slain on the battle-field will attract them in flocks from a great distance, the death of any beast of the field summons an assembly to the banquet. Sailing on wide and ample wings, they sweep from the higher regions of the air to their repast, on which they often gorge themselves until they are unable to rise from the spot. At the impulse of hunger alone the vulture is thus roused from his apathy, to go in quest of his carrion meal. Then, mounting aloft till almost out of sight, he skims in large circles, sustained on outspread but motionless pinions, scanning the surface of the earth.

The vultures are distinguished from other birds of prey by the entire or partial denudation of the head and neck, the latter of which is much elongated. This peculiarity of structure enables them to burrow in the putrid carcases on which they prey, without risk of spoiling their plumage. Other differences are observable, as the lateral position of the nostrils in a generally broad and powerful bill, curved only at its point, and clothed at its base by an extended naked skin, or cere; the nakedness of the tarsi, which are covered only with small, reticulated scales; and the strong, thick talons, somewhat blunted at the points, but little curved, and scarcely, if at all, retractile.

THE CONDOR.*

The Condor is peculiar to the New World, but it approaches very closely, in its most essential characters, to the vultures of the Old Continent. Like the king vulture, which will next be described, it differs from the latter principally in the large, fleshy, or rather cartilaginous caruncle, which surmounts its beak; in the large size of its oval and longitudinal nostrils, placed almost at the very extremity of the cere, and in the comparative length of its quill feathers, the third being the longest of the series.

Forty years ago, one or two mutilated specimens of this bird formed the only memorials of its existence in the cabinets of Europe, and all the knowledge possessed of it was derived from some settlers but little acquainted with natural history. Vague and erroneous was it, when some repeated without examination whatever stories happened to be current; and others, less scrupulous, or more fanciful, allowed imagination unrestricted to describe the condor. The roc of eastern mythology—the wondrous guardian of immense mountain treasures—was, however, sufficient for their purpose, and so this monstrous bird was said to be equalled, if not surpassed, by this native of the Andes. Garcilasso expressly says, there are some condors in Peru sixteen feet from the point of one wing to that of the other, and that a certain nation of Indians adore them.

Even Buffon exaggerated its size; and Vieillot truly remarks: "It was with the condor as it was with the Patagonians—both shrank before examination." Often nestling on the ridges of rocks which border the lower limit of perpetual snow, and standing forth in solitary majesty, crowned with its extraordinary comb, it appeared to the eyes of Humboldt himself as a winged giant. Precisely contrary, however, was the effect of the grand scenery around on Lieutenant Mann, as he descended into the deep and narrow valley of Magdalena. Several of these birds, he says, hovered around and about the rocks on which they build their nests, but so vast was the scale of these rocks and mountains, that even these immense birds appeared quite insignificant, and he doubted, for a time, that they were condors.

All optical illusions ceased on the actual measurement of this bird. The extent of its wings scarcely exceeds fourteen feet, and even this it appears but rarely to attain. Humboldt in his travels met with no one that went beyond nine feet, and was assured by many credible inhabitants of Quito that they had never shot any that measured more than eleven. The length of one male specimen, somewhat less than nine feet in expanse, was three feet three inches from the tip of the beak to the extremity of the tail; and its height, when perching, with the neck partly withdrawn, two feet eight inches. Its beak was two inches and three quarters in length, and an inch and a quarter in depth, when closed.

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* Sarcoramphus gryphus: Duméril.

The beak of the condor is straight at the base, but the upper mandible becomes arched towards the point, and terminates in a strong and well-curved hook. The basal half is of an ash-brown, and the remaining portion towards the point is nearly white. The head and neck are bare of feathers, and covered with a hard, wrinkled, dusky-reddish skin, on which are scattered some short brown or blackish hairs. On the top of the head, which is much flattened above, extending some distance along the beak, is attached an oblong, firm caruncle, or comb, covered by a continuation of the skin which invests the head. This organ is peculiar to the male. It is connected with the beak only in its anterior parts, and is separated from it at the base in such a manner as to allow of a free passage of the air to the large, oval nostrils, which are situated beneath it at that part. Behind the eyes, which are somewhat elongated, and not sunk beneath the general surface of the head, the skin of the neck is, as it were, gathered into a series of descending folds, extending obliquely from the back of the head, over the temples, to the under side of the neck, and there connected entirely with a lax membrane, or wattle, capable of being dilated at pleasure, like that of the common turkey. The neck is marked by numerous deep parallel folds, produced by the habit of retracting the head, in which the bird indulges when at rest. In this position scarcely any part of the neck is visible.

CATTLE ATTACKED BY CONDORS.

On the lower part of the neck, the female, as well as the male, is provided with a broad white ruff of downy feathers, which forms the line of separation between the naked skin above and the true feathers covering the body below it. All the other feathers, with the exception of the wing coverts, and the secondary quill-feathers, are of a bright black, generally mingled with a grayish tinge, of greater or less intensity. In the female, the wing coverts are blackish-gray; but the male has their points, and, frequently, as much as half their length, white. The wings of the latter are consequently distinguished from those of the female by their large white patches. The secondary quill-feathers of both sexes are white on the outer side. Ulloa asserted that, in the colder parts of Peru, the skin is so closely covered with feathers, that eight or ten balls may be heard to strike it without penetrating its body. The tail is short and wedge-shaped. The legs are excessively thick and powerful, and are coloured of a bluish-gray, intermingled with whitish streaks. Their elongated toes are united at the base by a loose but very apparent membrane, and are terminated by long black talons of considerable thickness, but very little curved. The hinder toe is much shorter than the rest, and its talon, although more distinctly curved, is equally wanting in strength—a deficiency which renders the foot much less powerful, as an organ of prehension, than that of any other of the large birds of the raptorial order.

HEAD OF THE CONDOR.

The immense mountain chain of the Andes, which runs down the continent of South America, is the native stronghold, where these birds dwell securely; in Peru and Chili they are even abundant, but more than three or four are seldom seen together. There, in the regions of perpetual snow, and of terrific storms, 15,000 feet above the level of the sea, on some isolated pinnacle or crag, the condor rears its brood, and looks down on the plains beneath, yet far away, for food, from the towering elevations, which, with their declivities and valleys, cover about a sixth part of that continent. We have learned much respecting it from Humboldt, and his fellow-traveller, Bonpland; for whenever they reached, in their botanical excursions, the limits of perpetual snow, three or four condors always appeared on the points of the rocks, showing no distrust, suffering themselves to be approached to within a short distance, and seeming indisposed to make an attack. Though here these birds find their home, they build no nest, but deposit their eggs on the naked rocks, without surrounding them even with straw or leaves. The eggs are white, and from three to four inches in length. The female remains with her offspring for the space of an entire year.

Of all birds, the condor mounts highest into the atmosphere. Humboldt describes the flight of it in the Andes to be at least 20,000 feet above the level of the sea. From the cave of Antisana, elevated 12,958 feet above the level of the Pacific Ocean, he saw this bird soaring at a perpendicular height of 6,876 feet. He says it is a remarkable circumstance, that this bird, which continues to fly about in regions where the air is so rarefied, descends all at once to the edge of the sea, and thus, in a few minutes, passes through all the variations of climate. At a height of 20,000 feet, the air-cells of the condor, which are filled in the lowest regions, must be inflated in an extraordinary manner.

Many years ago, Ulloa expressed his astonishment that this bird could fly at a height where the mean pressure of the air is only fourteen inches. It was then imagined, from experiments made with the air-pump, that no animal could live in so rare a medium; but Humboldt has seen the barometer on Chimborazo fall to thirteen inches eleven lines; and Gay Lussac respired for a quarter of an hour in an atmosphere whose pressure was even less than this. At these heights, man generally finds himself reduced to a painful state of debility, while the condor, on the contrary, appears to breathe freely. Of all living beings, it appears to be the one that can rise, at will, to the greatest distance from the earth's surface.

When driven by hunger, the condor descends into the plains, but leaves them as soon as its appetite is satiated, as if the increased weight of the atmosphere, and the warmer temperature there, soon became oppressive. It prefers resting on the ground, for which its comparatively straight talons are peculiarly fitted, to perching on trees. Like the rest of its family, it subsists on carrion, and so gorges itself as to become incapable of flight. The Indians, who are well acquainted with this effect of voracity, turn it to account for their amusement in the chase. For this purpose, they expose the dead body of a horse or a cow, by which some of the condors, which are generally hovering in the air in search of food, are speedily attracted. As soon as the birds have glutted themselves on the carcase, the Indians make their appearance, armed with the lasso, and the condors, being unable to escape by flight, are pursued and caught by this singular weapon. This sport is regarded in South America as second to that of the bull-fight alone — the Indians galloping away, and dragging after them the ensnared victims.

Sir Francis Head says :—"In riding along the plain, I passed a dead horse, about which were forty or fifty condors, many of which were gorged and unable to fly; several were standing on the ground devouring the carcase, the rest hovering above it. I rode within twenty yards of them; one of the largest of the birds was standing with one foot on the ground, and the other on the horse's body, with a display of muscular strength as he lifted the flesh, and tore off great pieces, sometimes shaking his head, and pulling with his beak, and sometimes pushing with his leg.

"Got to Mendoza, and went to bed. Wakened by one of my party who arrived; he told me that, seeing the condors hovering in the air, and knowing that several of them would be gorged, he had also ridden up to the dead horse, and that, as one of these enormous birds flew about fifty yards off, and was unable to go any farther, he rode up to him; and then, jumping off his horse, seized him by the neck. The contest was extraordinary, and the *rencontre* unexpected. No two animals can well be imagined less likely to meet than a Cornish miner and a condor, and few could have calculated a year ago, when the one was hovering high above the snowy pinnacles of the Cordillera, and the other many fathoms beneath the surface of the ground in Cornwall, that they would ever meet to wrestle and 'hug' upon the wide desert plain of Villa Vicencia. My companion said, he had never had such a battle in his life; that he put his knee upon the bird's breast, and tried with all his strength to twist his neck; but that the condor, objecting to this, struggled violently, and that, also, as several others were flying over his head, he expected they would attack him. He said that, at last, he succeeded in killing his antagonist, and, with great pride, he showed me the large feathers from his wings; but, when the third horseman came in, he told us he had found the condor in the path, but not quite dead."

Sir Francis also says :—"When I was at one of the mines in Chili, I idly mentioned to a person that I should like to have a condor. Some days afterwards, a guacho arrived at Santiago with three large ones. They had all been caught with a noose, and had been hung over a horse; two had died of galloping, but the other was alive. I gave the guacho a dollar, who immediately left me to wonder what I could do with three such enormous birds."

The condor does not confine itself to carrion, but sometimes pounces on living animals. Ulloa states that, observing on a hill, adjoining to that where he stood, a flock of sheep in great confusion, he saw one of these birds flying upwards from among them, with a lamb betwixt its claws; and when at some height, the condor dropped it. The bird immediately followed, took it up, and let it fall a second time, when it flew out of sight, on account of the Indians, who, at the cries of the boys and the barking of the dogs, were running towards the place.

These gigantic birds, however, contrary to what has been asserted, are far from being formidable. They are not ferocious, and their talons are too feeble to lacerate, nor, from this cause, can they carry away weights which prove no obstacle to an eagle. The natives do not fear them; they are accustomed, with their children, to sleep near their place of resort, and the little ones are about their fathers while engaged in collecting the snow to sell it in the neighbouring towns; yet no danger is apprehended, nor has it, according to Humboldt, ever been heard that one of them has been attacked or killed. So much, then, for such tales as that of Garcilasso :—"Two of them will dare to attack a cow or a bull, and will devour it; neither do they abstain from the human race, but will set upon and slay, single-handed, boys of ten or twelve years; and it is by a providence of Nature, for the protection of the flocks and the natives, that many are not hatched; for, if they were numerous, they would cause great slaughter among the herds, and the greatest damage to the inhabitants."

When these birds are first taken, they are sulky and timid; but the latter feeling soon wears off, and they become savage and dangerous. After a time, however, they seem to become reconciled to captivity, and to bear it tolerably well. A fine condor, purchased for the Zoological Society in Holland, many years ago, was as quiet and resigned as any one of the birds of prey living in the Gardens, where these, as well as others, may be studied with the greatest advantage.

Of the strength of the condor, the following is an instance :—Feuillée was in the valley of Ylo, in Peru, when he discovered one perched upon a great rock ; he approached it within musket-shot and fired ; but, as the gun was only loaded with swan-shot, the lead could do little more than pierce its feathers. He perceived, however, from its motions, that it was wounded ; for it rose heavily, and could with difficulty reach another great rock, five hundred paces distant on the sea-shore. He therefore charged his piece with a bullet, and hit the condor under the throat. He then saw that he had succeeded, and ran to secure the victim ; but it struggled obstinately with death, and, resting on its back, repelled his attempts with its extended talons. He was at a loss on which side to lay hold of it, and he believed, if it had not been mortally wounded, he should have found great difficulty in securing it. At last, he dragged it down from the top of the rock, and, with the aid of a sailor, carried it away to his tent.

The condor exceeds almost every other bird in its tenacity of life. During Humboldt's stay at Riobamba, he witnessed some experiments which were made on one by the Indians, who had taken it alive. They first strangled it with a lasso, and hung it on a tree, pulling it forcibly by the feet for several minutes ; but scarcely was the lasso removed, when the bird arose and walked about as though nothing had happened. A pistol, loaded with three balls, was then discharged at less than four paces, all of which entered its body, and wounded it in the neck, chest, and abdomen, but it still kept its legs. Another ball struck its thigh, and it fell to the ground : this was preserved by M. Bonpland for a considerable time, as a memorial of the circumstance. The bird did not die of its wounds until half an hour had elapsed.

THE KING VULTURE.*

The royal name which this bird bears is not derived from its majestic appearance—for it is one of the smallest species of the family—but from its being often surrounded by troops of common vultures, who seem, even under the pressure of hunger, to acknowledge its precedence : hence its usual name in Mexico seems to be Tzopilotl, literally, King of the Vultures. Sonnini states that, in Guiana, it bears a title exactly synonymous ; and in Paraguay, according to D'Azara, that of Iribnrubicha, which signifies the same thing.

At its maturity, this bird measures about two feet and a half in total length, and more than twice as much in the extent of its wings. It is, unquestionably, the most elegant of its tribe. The naked skin of the head and neck is deeply tinged with mingled orange and violet ; over its beak there hangs a loose comb of bright orange ; the general plumage is of a delicate fawn colour ; the quill and tail feathers are black ; the iris is pearly white, a scarlet circle surrounds the eye, and the remainder of the side of the head is purplish-black. The back of the head is covered by a patch of short, blackish down ; and behind the eye, on either side, are several broad and deep wrinkles of the skin, giving rise to a thick and prominent fold, which extends obliquely downwards along the whole of the neck. This fold is of a reddish brown, mingled with blue, and is traversed by numerous lines of minute black hairs. From the upper part of the neck, which is of a bright red, the colour gradually becomes less intense, and fades into orange and yellow as it descends towards the lower part. The legs and claws are generally of a dusky black ; but sometimes the former are reddish, and, at others, of a dirty-yellowish white.

The King Vulture, like the condor, is a native of South America, but is not a mountain bird. On the contrary, it delights itself in the intertropical regions of America and the adjacent islands, among the most luxuriant scenery of Nature, forests and low savannahs, where animal life abounds, and putrefaction speedily follows death. Bonaparte mentions it among the birds of the United States, and it is said to have been occasionally met with in Florida, which is probably its northern limit. Towards the south, D'Azara describes it as common in Paraguay, but states that it does not pass the thirty-second degree of latitude. In the intermediate countries it appears to be extremely abundant, and many travellers mention it as congregating in large flocks in various parts of Mexico.

Contrary to the habits of their family in general, these birds perch on the tallest trees, living solitary, or in pairs, building their nests in the hollows of the trunks, and laying only two eggs. In walking, their gait is slow and heavy, and their body is maintained in a horizontal position. They endure the pangs of hunger with extraordinary patience. When about to mount into the air, they are compelled to take several leaps before they can do so, and have some little difficulty in quitting the ground. The odour of their flesh is precisely that of the carrion on which they feed, and even their skins

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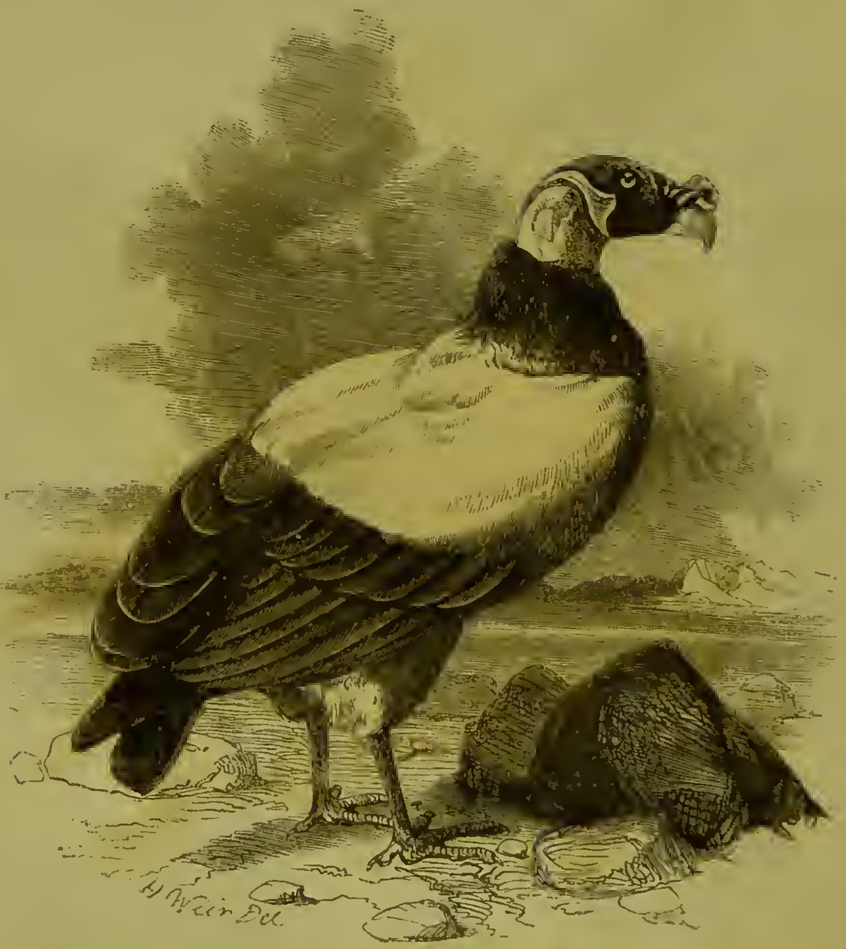
* Sarcoramphus papa.

THE KING VULTURE AND ITS PREY.

retain it for many years. When carrion is deficient, they feed on snakes and lizards, and, during the summer, chiefly subsist on the putrid fish of the lakes, that are dried up by the parching heat of the sun.

Waterton mentions that, while sailing up the Essequibo, he observed a pair of these birds sitting on the naked branch of a tree, with about a dozen of the common species, waiting to begin the feast on a goat which a jaguar had killed the day before, and been obliged to abandon; and still, though tolerating the company of its inferiors, it appeared to guard its royal privileges with jealous care.

On another occasion, this naturalist directed the body of a large serpent he had killed to be carried into the forest, in order to tempt this kingly bird; and he thus describes the result:—"The foliage of the trees where we laid it was impervious to the sun's rays, and, had any vultures passed over that part of the forest, I think I may say with safety, that they could not have seen the remains of the serpent through the shade. For the first two days not a vulture made its appearance at the spot, though I could see, here and there, as usual, a *vultur aura* gliding on apparently immovable pinions, at a moderate height, over the tops of the forest trees; but during the afternoon of the third day, when the carcase of the serpent had got into a state of putrefaction, more than twenty of the common vultures came and perched upon the neighbouring trees, and the next morning, a little after six o'clock, I saw a magnificent king of the vultures. There was a stupendous mora-tree close by, whose topmost branch had either been dried by time, or blasted by the thunder-storm. Upon this branch I killed the king of the vultures, before it had descended to partake of the savoury food which had attracted it to the place. Soon after this, another king of the vultures came, and, after he had stuffed himself almost to suffocation, the rest pounced down upon the remains of the serpent, and stayed there till they had devoured the last morsel."



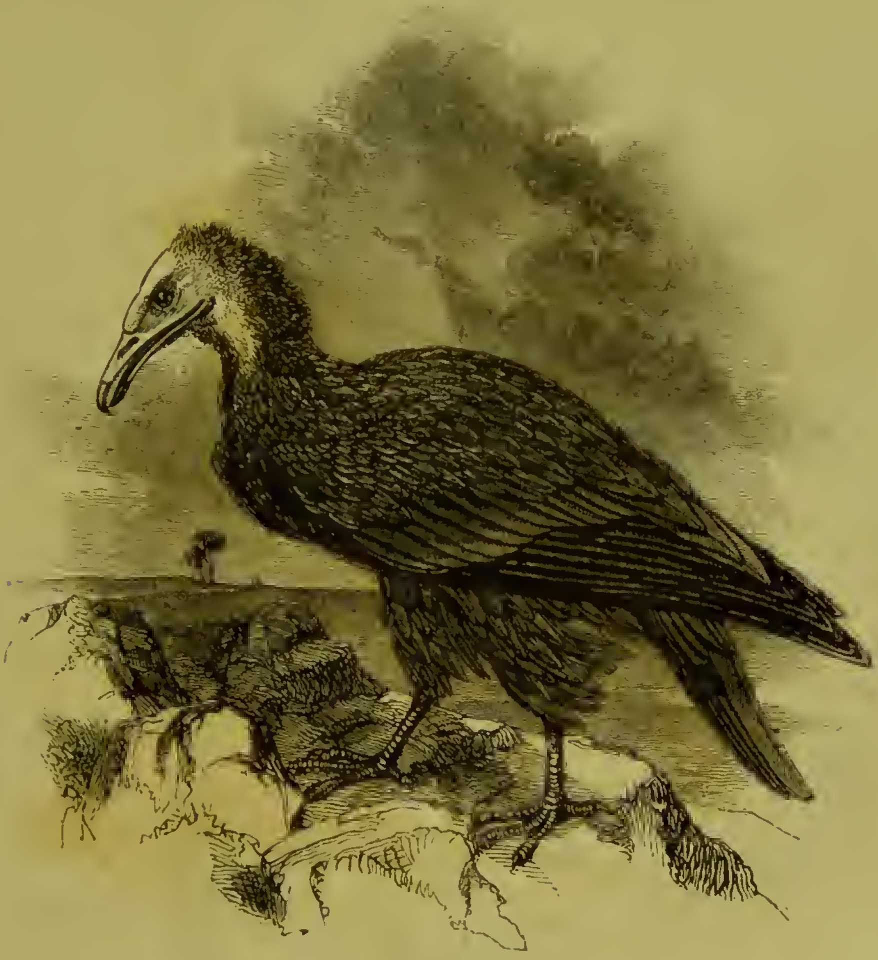
THE KING VULTURE.

It is worthy of remark that, as Hernandez states, this bird, so commonly called the king vulture, or the king of the vultures, is the Cozcaquauhtli, or queen of the vultures, of the Mexicans.

The question still remains to be settled, Is it by the power of sight or smell that these birds afar off in the air above, or on the very verge of the horizon, are directed to their prey? Poets and philosophers have dwelt on the "delights" with which they—

> " ——— snuffed the smell
> Of mortal change on earth . . . . . .
> Sagacious of the quarry from afar;"

and Mr. Waterton, with other naturalists, sustained by the development of the organs of this sense in these birds, decidedly favours the opinion. M. Audubon contends, on the contrary, that it is by extraordinary power of sight that the vulture perceives its prey; and M. Vaillant explains the circumstance on the same theory.



THE EGYPTIAN VULTURE.

THE EGYPTIAN VULTURE.*

This bird, the Vautour Ourigourap of Le Vaillant; the Rhachamah, or Pharaoh's Hen of Bruce, and others; and the Maltese Vulture of Latham, is found very rarely in the north of Europe and Switzerland, but is very common in Spain, on the Pyrenees, Portugal, Malta, Turkey, and in the Archipelago. Nowhere, however, is it so abundant as in Africa.

The Neophron appears to have its stronghold in Africa. We have received it from the vicinity of the Cape of Good Hope. Travellers have noticed it occurring on the northern coasts, and on the shores opposed to Europe it is extremely abundant; whence, crossing to Southern Europe, the frequency continues, but gradually decreases as an advance is made northwards, and France and Britain may be accounted the utmost limits to which wanderers occasionally stray.

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* Neophron percnopterus.

Notwithstanding, however, its great abundance in Spain and the opposite African shores, little, as yet, is known of its habits. Its general food appears to be carrion, of all kinds, and, in some parts, it is protected, on account of its utility in clearing off putrid substances. Bruce states that it is a very great breach of order, or of police, to molest or kill these birds near Cairo. In Egypt, the utility of these vultures, in clearing the streets of filth of every description—a task which they undertake in common with the pariah dogs—has often been noticed; nor were the services of this bird less valued in ancient than in modern times; it was among the number of the sacred animals, and is often represented, with tolerable accuracy, on the early monuments of Egypt: hence its appellation of "Pharaoh's chicken." A constant attendant on the caravan, as it wends its way from town to town, an assiduous frequenter of the shambles, an industrious searcher for carrion, it merits, so far as public utility is concerned, the regards of the community; nor are its services overlooked; for, if not now adored as a deity, it is at least esteemed as a benefactor. In the neighbourhood of Gibraltar, and in the South of Spain generally, flocks of this vulture are annually seen; and it is probable that they winter in Africa. Captain S. E. Cook says he saw them near Seville, following the track of the plough, like rooks, in order to discover the grubs in the upturned soil.

These vultures do not congregate, except when a specially attractive carcase calls them together, but go in pairs, the male and female seldom parting company. According to Mr. Yarrell, in the districts which this species inhabits, every group of the natives has a pair of these vultures attached to it. The birds roost on the trees in the vicinity, or on the fences which bound the inclosures formed by the cattle. They are, to a certain degree, domiciled and harmless. The people do them no injury, but are glad to see and encourage them, because they clear the premises of all the offal and filth they can find.

Occasionally, this vulture is said to feed on reptiles and the smaller animals. Of its nidification we are equally ignorant. According to Temminck, it breeds in the most inaccessible places, in the holes or fissures of some perpendicular cliff; but of the number or colour of the eggs he says nothing. Bruce says that there are two, and that the nest is built in the most desert parts of the country; but here his information ceases.

In size, the Egyptian Vulture somewhat exceeds a raven, its length being two feet five or six inches, and the expanse of its wings about five feet eight or nine inches. Long and ample as they are, they give the bird amazing power of flight, and enable it to soar with great buoyancy.

A single specimen of this bird was killed on the shores of the British Channel in October, 1825, and became the possession of the Rev. A. Mathew, of Kilve, in Somersetshire. When first discovered, it was feeding on the carcase of a dead sheep, and had so gorged itself with the carrion as to be unable or unwilling to fly to any great distance at a time; it was, therefore, approached without much difficulty and shot. Another bird, apparently of this species, was seen at the same time on the wing at no great distance, but could never be approached within gun-shot. The one procured at this time was in immature plumage, the dark feathers of the young beautifully mixed with others of a rich cream-yellow. The colour of the naked skin on the head was of a livid flesh-coloured red; that of the legs, of a pale yellowish gray.

The adult birds have the plumage nearly of a uniform yellowish white or cream colour, excepting the quills, inner webs, and base of the secondaries: the former are blackish; the latter, liver-brown, which, on the outer webs, gradually shades into the cream colour. The feathers on the hind head and neck are lanceolate, very pointed and hackled, and appear to be occasionally raised when the bird is under the influence of either fear or anger. The head, before the ears, is bare of feathers; a few straggling hair-like tufts appearing on the chin, and marking superciliary ridges and a circle round the ears. The skin on these parts, in the adult birds, is gamboge yellow; but, in the Somersetshire specimen, which the naturalist who describes it saw before it was dried, the colour was livid: this undergoes a change as the bird approaches its mature state.

The young of the year have the head thinly covered with down, and, as we observed, have the colouring of the uncovered parts of a less clear appearance than in the adults; the plumage is entirely of a dull blackish-brown, with yellowish spots on the tips of the feathers. The quills, however, are black, though not of so clear a tint as in the old birds. In approaching to maturity, the dark parts of the plumage assume a rich purplish-brown tint, the feathers appear more glossy, and these dark parts afford a pleasing and strong contrast to the cream yellow of the body. The length of the specimens we have received from South Africa is two feet two or three inches.

THE GRIFFON VULTURE.*

This splendid species—Le Griffon of the French, the Weissköpfiger Geier of the Germans—is spread from the South of Europe throughout Turkey, Persia, and Africa, everywhere choosing its abode among lofty rocks and mountains. It appears, however, to be merely a summer visitant in Europe, passing, on the advance of the colder season, over into Africa; and hence, at certain periods, flocks of forty or fifty are seen to cross the straits of Gibraltar, many having made the rock itself a temporary residence. It is, however, most abundant in the Pyrenees and the mountain districts of Spain, especially Granada; it is also found in the Alps and the Tyrol.

THE GRIFFON VULTURE.

Like all the other birds of its tribe, it feeds principally on carrion, to which it is frequently attracted in very considerable numbers. That eminent naturalist, Mr. Bennett, says:—"When it has once made a lodgment on its prey, it rarely quits the banquet while a morsel of flesh remains; so that it is not uncommon to see it perched upon a putrefying corpse for several successive days. It never attempts to carry off a portion, even to satisfy its young, but feeds them by disgorging the half-digested morsel from its maw. Sometimes, but very rarely, it makes its prey of living victims; and even then, of such only as are incapable of offering the smallest resistance; for, in a contest for superiority, it has not that advantage which is possessed by the falcon tribes, of lacerating its enemy with its talons, and must, therefore, rely upon the force of its beak alone. It is only, however, when no other mode of satiating its appetite presents itself, that it has recourse to the destruction of other animals for its subsistence.

"After feeding, it is seen fixed for hours in one unvaried posture, patiently waiting until the work of digestion is completed, and the stimulus of hunger is removed, to enable and to urge it to mount again into the upper regions of the air, and fly abroad in quest of its necessary food. If violently disturbed after a full meal, it is incapable of flight until it has disgorged the contents of its stomach; lightened of which, and freed from their debilitating effects, it is immediately in a condition to soar to such a pitch as, in spite of its magnitude, to become invisible to human sight."

The Griffon Vulture is about three feet six inches in length, and eight or nine feet in the expanse of its wings. The general colour of the adult is a deep rufous gray, which becomes black on the quill-feathers and the tail. The head and neck are covered with short, close down, which, as well as the beautiful ruff which encircles the lower part of the neck, are of a pure white. The nest is placed in the clefts of a rock, from whence this vulture can look out on the surrounding country, while, perhaps, its mate is gorging on a carcase in the distant plain. It lays from two to four eggs, which are of a grayish-white, with numerous spots of a very light and diluted red. The young are of a bright-fawn colour, and do not acquire their full livery until the close of the third year.

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* *Vultur fulvus.*

In captivity, the only desire of the griffon vulture appears to be that of some creatures of a higher grade—to obtain a regular supply of food. Only let this be secured, and it is seemingly indifferent to all other circumstances.

THE TURKEY VULTURE.*

This bird—a specimen of the genus *Cathartes*—is peculiar to America, and, like the rest, may be thus characterised :—The beak feeble, elongated, and curved only at the top ; the head and part of the neck bare of feathers ; the skin loose and carunculated ; there is a tendency to a ruff round the bare space below the neck ; the nostrils have narrow, longitudinal apertures ; the wings extend beyond the tail. The general colour of the plumage is a glossy brownish-black, with green reflexions. In length, it measures two feet four or five inches, and its stretch of wing is about six feet.

These vultures, unless when rising from the earth, seldom flap their wings, but sweep along in ogees, and dipping and rising lines, and move with great rapidity. They are often seen in companies, soaring at an immense height, particularly previous to a thunder-storm. Their wings are not spread horizontally, but form a slight angle with the body upwards, the tips having an upward curve. They never fail to discover carrion, even when several miles from it. When once they have found a carcase, they will not leave it, if unmolested, until the whole is devoured.

A man in the state of Delaware, as Wilson relates, observing some of these birds regaling themselves on the carcase of a horse, which was in a highly putrid state, and on which they had feasted till scarcely able to move, thought it would amuse his children if he could take one home. Cautiously approaching and springing on the unsuspicious group, he grasped a fine, plump bird in his arms, and was bearing off his prize in triumph, when the vulture, indignant at the outrage, disgorged such a torrent of filth in his face, as made his first experiment the last he ever made.

Mr. Waterton states, that though the flocks collect for a common feast around a carcase, he does not consider the Turkey Vulture, properly speaking, to be gregarious, but each pair to pursue its separate interests ; and this may be the case with vultures generally, and with even those like the present species, which assemble in multitudes wherever they can discover a banquet. The same naturalist states that he could never see this bird feeding on that which was not putrid ; and that often, when he had thrown aside the useless remains of birds and quadrupeds, after dissection, though soaring up and down all the day long, it would never descend to feed upon them, or to carry them off, until they were in a state of putrefaction.

Mr. Waterton adds another curious fact :—"When I carried Lord Collingwood's dispatches up the Oronoco to the city of Angustura, I there saw the common vultures of Guiana nearly as tame as turkeys ; the Spaniards protected them, and considered them in the light of useful scavengers. They were flying about the city in all directions."

According to Humboldt, the carcases of horses, mules, and cows, attract innumerable vultures. Of South America, he says, the *zamuros*, as they are called, are the ibises of this country, and they render the same service to the inhabitants of the Llanos as the *vultur percnopterus* to the inhabitants of Egypt.

At sunrise, he often saw them in flocks of forty or fifty, perched on the cocoa-trees. They range themselves in files to roost together like fowls. They go to roost long before sunset, and do not awake till after the sun is above the horizon—a sluggishness which seems as if it were shared in those climates by the mimosas, the tamarinds, and other trees with pinnate leaves.

Humboldt also says : "We met some large herds of cattle, and with them flocks of birds of a black colour, with an olive shade. They follow the cattle. We had often seen them perched on the backs of cows, seeking for gadflies, and other insects. The Spanish colonists call them *zamurito*, little carrion vulture,† or *garapatero*, the eater of *garapatas*, insects of the Acarus family. Like many birds of these desert places, they fear so little the approach of man, that children often catch them in their hands. In the valleys of Aragua, where they are very common, we have seen them perch upon the hammocks upon which we were reposing in open day."

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* Vultur aura : Wilson. Cathartes aura : Illiger.

Vultur aura minuta.

THE BLACK VULTURE.*

This bird, like the one just described, is respected at Charleston for the service that it renders in removing from the city all carrion, and other refuse, on which it exclusively feeds. Black vultures occupy themselves throughout the day to discover such substances, and then, coming down in legions, they contend violently for the prey, which immediately disappears. If even a chicken dies, its bones are speedily picked clean. And yet, strange to say, they may be easily knocked down with a stick. Descourtilz says, "I had a great desire to obtain a specimen in this way, but I was not disposed to pay the penalty of five louis-d'or."

Wilson, with his usual graphic power, thus pictures an occurrence near Charleston :—"A horse had dropped down in the street in convulsions, and dying, it was dragged out to Hampstead, and skinned. The ground, for a hundred yards around it, was black with carrion crows; many sat on the tops of sheds, fences, and houses, within sight; sixty or eighty on the opposite side of a small inn. I counted, at one time, two hundred and thirty-seven, but I believe there were more, besides several in the air over my head, and at a distance.

"I ventured cautiously within thirty yards of the carcase, where three or four dogs and twenty or thirty vultures were busily tearing and devouring. Seeing them take no notice, I ventured nearer, till I was within ten yards, and sat down on the bank. Still they paid little attention to me. The dogs being sometimes accidentally flapped with the wings of the vultures, would growl and snap at them, which would occasion them to spring up for a moment, but they immediately gathered in again. I remarked that the vultures frequently attack each other, fighting with their claws, or heels, striking, like a cock, with open wings, and fixing their claws in each other's head. The females, and, I believe, the males likewise, made a hissing sound, with open mouth, exactly resembling that produced by thrusting a red-hot poker into water; and frequently a snuffling, like a dog clearing his nostrils, as I suppose they were theirs.

"On observing that they did not heed me, I stole so close that my feet were within one yard of the horse's legs, and again sat down. They all slid aloof a few feet, but, seeing me quiet, soon returned as before. As they were often disturbed by the dogs, I ordered the latter home; my voice gave no alarm to the vultures. As soon as the dogs departed, the vultures crowded in such numbers, that I counted at one time thirty-seven on and around the carcase, with several within; so that scarcely an inch of it was visible.

"Sometimes one would come out with a large piece of the entrails, which, in a moment, was surrounded by several others, who tore it in fragments, and it soon disappeared. They kept up the hissing occasionally. Some of them, having their whole legs and head covered with blood, presented a most savage aspect. Still, as the dogs advanced, I would order them away, which seemed to gratify the vultures; and one would pursue another to within a foot or two of the spot where I was sitting. Sometimes I observed them stretching their necks along the ground, as if to press the food downwards."

The Black Vulture is nearly the size of the griffon vulture, and sometimes still larger. It has a collar of long, narrow, and bristling feathers; the naked skin of the head and neck is blue, and garnished with down; the beak is blackish; and the long feathers of the leg sometimes descend sufficiently to cover the tarsus as far as the toes. The plumage, during the first year, is varied with brown and dirty gray: it is only in the fourth year that the down of tho head and the feathers are black.

THE BEARDED VULTURE.†

There is little in the general aspect of this bird to recall the vulture, and yet the character of the head and the general contour of the body are strikingly different from those of the eagle. There is a want of dignity and quiet majesty in its attitude, while the glance of its red eye, though keen and cruel, has not that expression of daring and resolution so conspicuous in the feathered sovereign. Hence an intermediate situation has been assigned it, and which is aptly expressed in the generic appellation, *gypaëtus*—a Greek compound, denoting a vulture and an eagle—and is clearly indicated in its robust form and general habits. The bristly beard, which depends from the lower mandible, tends, also, to give a peculiar character to its physiognomy.

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* Vultur Iota: Bonaparte.

† Gypaëtus barbatus.

Equalling or exceeding the largest eagle in size, this fine bird is found throughout the great mountain chains of the Old World, being, in fact, though not anywhere numerous, widely dispersed. It occurs in the Pyrenees and in the Alps of Germany and Switzerland. Of its nidification little is ascertained, except that it selects the most inaccessible pinnacles as the site of its eyrie. Pallas states that it is known to breed on the high rocks of the great Altaic chain, and beyond the lake Baikal. Hence it has been said of this bird :—

> "Horror wide extends
> His desolate domain."

In length, this bird measures about four feet from the bill to the end of the tail, and from nine to ten in the extent of its wings. The tarsi are short, and almost hidden by the feathers of the thighs; the iris is bright-red; the wings are ample, the second and third quill-feathers being the longest; the tail is graduated; the head is clothed with feathers, and from the sides of the under mandible proceed a row of black bristles, which form a beard or pencil at its angle, and a layer of similar bristles, beginning at the eye, covers the nostrils: hence it is often called by the natives "Father Longbeard." The general colour of the upper surface is dark grayish-brown, the centre of each feather having a longitudinal dash of white. The neck and the whole of the under surface are white, tinted with reddish brown. The young birds are darker in the general hue of their plumage than the adult, and the white spots are larger and less defined. In this stage, it has even been mistaken for a distinct species.

As the great bodily power, the ample wings and the tail sufficiently indicate, the flight of this bird is sweeping and majestic. It gaily sails around the Alpine summits, whence it marks its quarry from afar, and, collecting all its energies for the onset, glides with arrow-like force on its prey. If, however, it be lured from its aerial altitude by carrion, it no longer emulates the eagle in its pounce, but, calmly descending to some neighbouring crag, it thence sets out, flying with heavy wings, at a short distance from the ground, towards its foul repast, to be joined by others of its species.

Not only does it banquet on carrion, but it spreads devastation far and wide among the peaceful tenants of the fold, and the wild but timid inhabitants of the hills, the meadows, and the lawns. The swiftness and activity of the hare, the chamois, or the nimble marmoset, afford them no security against their winged foe, nor can the smallest quadrupeds escape its piercing ken. It is from the lamb becoming the frequent victim of this bird, that the Swiss peasants call it the *Lammer-geyer*, literally, the "lamb vulture." Often, too, does it watch till the unwary chamois approaches the edge of a precipice, or traverses the pass of a narrow ledge, and then, sudden and impetuous as the avalanche of its native regions, it rushes down, hurling its victim into the abyss beneath, when, after making a few proud gyrations, as if exulting in its success, it plunges down to gorge itself on the still quivering flesh.

Bruce, the traveller, saw a bird of this kind on a high mountain near Gondar. His servants were refreshing themselves after a toilsome and rugged ascent, enjoying a most delightful climate, and eating a dinner of goat's flesh in the open air, when this bearded vulture came flying slowly along the ground, and sat down close to the meat, within the ring the men had made around it. A great shout, or rather a cry of distress, called their master to the spot.

He saw the vulture stand for a minute, as if to recollect itself, while the servants ran for their lances and shields. He now walked up to the bird as nearly as he had time to do, and saw it put its foot into the pan, where there was a large piece of goat's-flesh in water, prepared for boiling; but, feeling the smart, which it had not expected, it withdrew its foot, and gave up the piece it had held. There were two other large pieces of flesh—a leg and a shoulder—lying on a wooden platter; into these it now thrust its claws, and carried them off, looking wistfully, it was thought, at the large piece which remained in the warm water. Away it went, slowly over the ground, as it had come; but the face of the cliff—over which criminals are thrown—concealed it from view. The Mohammedans of the party were greatly alarmed, declaring that the vulture would return; the servants, on the other hand, were far from desiring a second visit, as they thought it had already taken more than its share.

Bruce, however, wished for a more intimate acquaintance with this bird, and loaded a rifle with ball, close to the platter by the meat. A prodigious shout was speedily raised: "He is coming! he is coming!"—a sufficient noise, indeed, to have dismayed a far larger creature. But whether it had some apprehension of danger, or its hunger was abated, is unknown; the vulture was seen to make a short turn, and then to sit down about ten yards before Bruce, the pan of meat lying between them. As the traveller could not be sure but its next move might bring him opposite to some of his people, so that it might actually seize the rest of the meat and make off, he shot it with the rifle-ball through the middle of the body, so that it lay down on the grass without a single flutter.

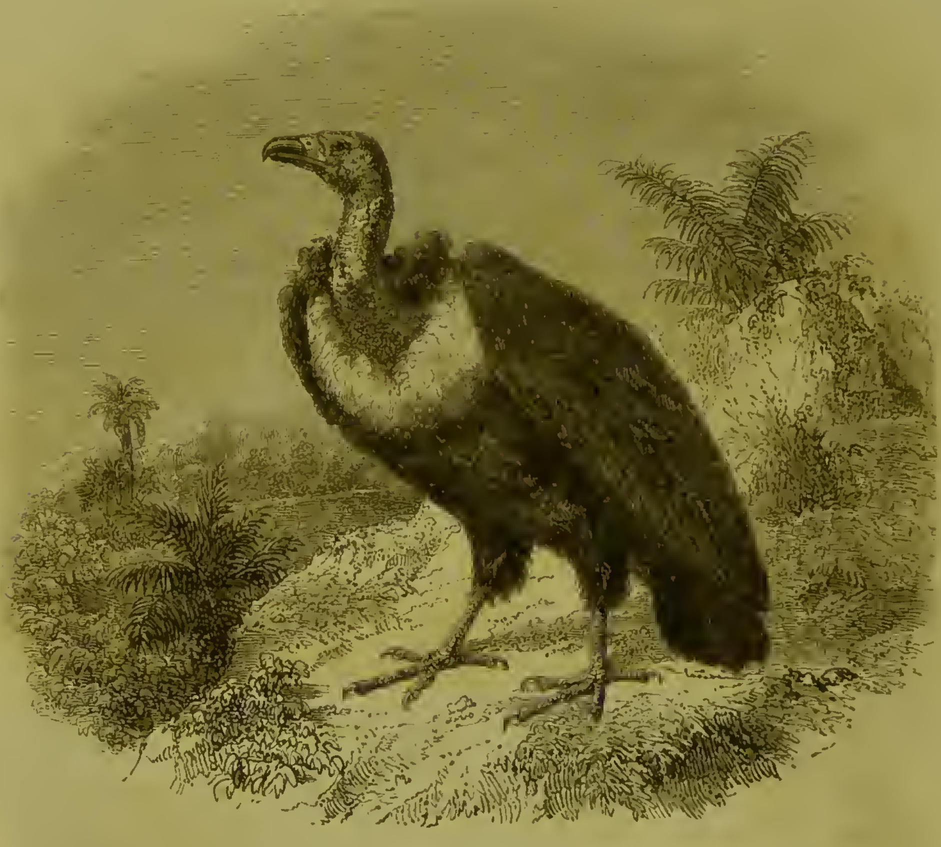
THE BEARDED VULTURE.

This vulture measured eight feet four inches from wing to wing; and from the tip of the tail to the point of the beak, four feet seven. Its weight was twenty-two pounds. The legs were short, and the thighs extremely muscular. The aperture of the eye was scarcely half an inch across. The crown of the head, and the forehead, where the juncture occurs between the beak and the skull, were bald.

THE SOCIABLE VULTURE.*

VERY rarely is this bird seen; and for the information we have of it we are indebted to M. Le Vaillant, who met with it repeatedly in the interior of Africa, and particularly in the country of the Namaquas. The expanse of the wings is upwards of ten feet. The head and greater part of the neck are of the colour of raw flesh, and exhibit, in their adult state, no appearance of down and feathers, but only a few, scarcely perceptible, scattered hairs. The throat is covered with blackish hairs, and the lower part of the neck, behind, with a kind of ruff of crisp and curling feathers of the same colour, within which the bird withdraws its head while in a state of repose, especially after feeding—an attitude which is common to most of the vultures. The folds on its neck originate behind the ears, surround the upper parts of these organs, and then pass downwards for several inches; they are somewhat irregular in their outline, and measure nearly an inch in breadth at the widest part.

All the feathers of the body, wings, and tail, are of a nearly uniform blackish-brown, somewhat lighter on the under than on the upper surface, and on the margins than in the middle. Those of the breast, belly, and sides beneath, are long, narrow, and pointed, and project from the body in such a manner as to exhibit the thick down of an almost pure white, with which it is everywhere closely covered. On the sides of the neck, at its lower and anterior part, this down extends beyond the feathers, and marks the boundary of the crop, which, as in all the vultures, is remarkably prominent. The legs are principally covered with a similar down, which, on them, assumes a brownish tinge. The beak is horn-coloured, with a shade of yellow at its base; the legs and feet brownish; the claws light-brown, and the iris chestnut. The young bird, when first hatched, is covered only with a whitish down; at the period when it quits the nest, its plumage is of a light brown, and all the feathers are bordered by a reddish tinge. Those of the chest and abdomen are not elongated, as in the adult state; and the head and neck are entirely covered by a fine, close down, through which the ears are scarcely visible.



THE SOCIABLE VULTURE.

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* Vultur auricularis.

The Sociable Vulture is a bird of the mountains; the sheltered retreats, formed by their caves and fissures, constituting its proper habitation. In them it passes the night, and reposes, after it has sated its appetite during the day. At sunrise large bands are seen perched on the rocks at the entry of their abodes, and sometimes a continued chain of mountains exhibits them as dispersed throughout the greater part of its extent. Their tails are always worn down by friction against the stones between which they thrust themselves, where they perch; while the eagles, seldom walking, and frequently perching upon trees, preserve theirs in a better state. Those of the vultures are injured, moreover, by the soil of the plains, inasmuch as they cannot raise themselves into the air at once, but only after running several paces forwards, and by a forced contraction of their limbs. The flight of the vultures is, nevertheless, no less powerful and lofty: they raise themselves to a prodigious height, and disappear entirely from the view.

The eggs of this bird are white, and not disagreeable to the taste. During incubation, the male watches before the entrance of the cavern in which the female sits, and may be regarded as a certain indication of the nest; but this is usually very difficult of access. "However," says Le Vaillant, "I have sometimes, with the aid of my Hottentots, surmounted all difficulties, and often risked my life that I might examine the eggs of this bird, whose retreat is a sink of disgusting pollution, and contaminated by an insupportable odour. It is the more dangerous to approach these obscure recesses, because their entrance is beset with filth, and this always in a liquid state, by reason of the moisture which incessantly oozes from the rocks, so that, by sliding on the points of these rocks, one runs the hazard of tumbling over hideous precipices, on the top of which the vultures preferably establish their abodes."

THE VULTURINE CARACARA EAGLE.

The sociable vulture has been taken in the neighbourhood of Athens, and may, therefore, be added to the catalogue of Birds of Europe.

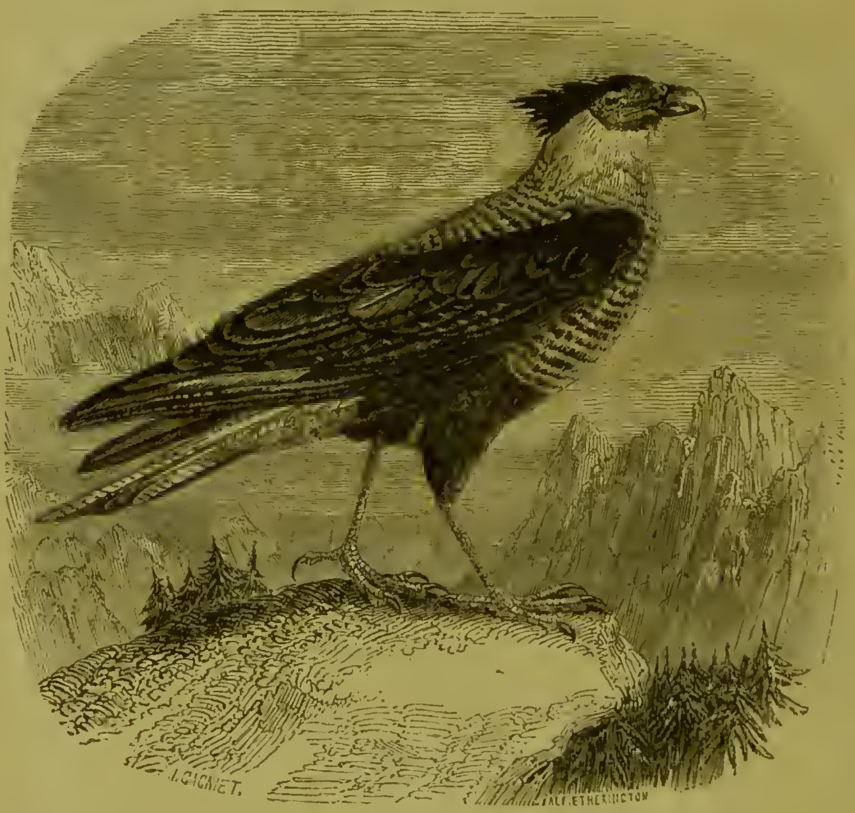
A genus* has been established by M. Vieillot, and regarded by him and most systematic writers as one of the connecting links between the Vulture and the Eagle tribes. Of this we shall give two specimens.

* Polyborus.

THE VULTURINE CARACARA EAGLE.*

THE resemblance of this bird to the vultures will at once be apparent; and hence we give it the precedence. Two of them, indeed, were sold, some years ago, to the Zoological Society, under the name of Pharaoh's Chickens, the common designation of the Egyptian Vulture. From that bird, however, they differ in many respects, while the very distinct character of the beak is alone sufficient to remove any idea of similarity which might be produced by their coincidence in general appearance. In the latter respect, as well as in several of their technical characters, they are truly vulturine, while, in many points of structure, in their air, and in their habits, they seem to approach more nearly to the eagles. They subsisted entirely on flesh, and refused fish, if offered to them.

The beak of these birds is deep, elongated, and nearly similar in form to that of the Caracara, but much more compressed and flattened at the sides; its upper surface is arched for the greater part of its length, the extreme point terminating considerably below the extremity of the lower mandible, which is embraced within it, and the opening being long, straight, and without dentation. The nostrils are placed transversely, and are long-oval in their form; and in these respects they differ from those of the Caracara. The naked space of the cheeks is less extensive, and less defined in its edges, but entirely surrounds the eyes, which are placed in both birds almost on a level with the general surface of the head. In the birds now under consideration, the head is narrower and less flattened above, and the neck more elongated; both which circumstances, as well as the somewhat downy character of the feathers by which these parts are covered, tend to increase their resemblance to the vulture tribes. The wings are long, reaching to, or even beyond, the extremity of the tail, and are rounded in their outline. The tail is even and slightly rounded; the rather long and slender legs are naked and reticulated from the joint downwards; the toes are rather short, and the talons weak and but little curved; the inner and the posterior alone being capable of grasping with any degree of firmness.



THE CARACARA EAGLE.

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* P. Hypoleucus.

THE CARACARA EAGLE.*

CARACARA, the vulgar appellation of this bird in Brazil, is derived from its hoarse and peculiar cry. Its resemblance to the vultures depends chiefly on the partial nakedness of its head, the prominence of its crop, and the position of its eyes on a level, or nearly so, with the general surface. But it bears a much closer relation to the eagles in almost every other point of its general structure, as well as in its habits and mode of life.

THE IMPERIAL EAGLE.†

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* Polyborus Vulgaris.

† Aquila Imperialis.

The whole upper surface of the head is black, with the feathers slightly elongated backwards, and capable of being partially elevated in the shape of a pointed crest. The entire neck is of a light brownish-gray, which also forms the ground colour on the breast and shoulders, but with the addition on these parts of numerous transverse wavy bars of a deeper brown. Nearly all the rest of the plumage is of a tolerably uniform shade of blackish-brown, with the exception of the tail, which is, at the base, of a dirty white, with numerous narrow, transverse, undulated bands of a dusky hue, and, in its terminal third black, without any appearance of banding. The beak is horn-coloured at the tip, and bluish at the base; the iris hazel; the cere and naked cheeks of a dull red; the legs yellow, and the claws black. Changes, however, occur in the plumage as the bird advances in age; and there is a very remarkable diversity of colour in this species.

This fine bird ranges over a considerable part of South America. It builds its nest upon the tops of trees, and prefers those which have the greater number of climbing shrubs about them. Where such are not to be found, it selects a bushy thicket, in which it forms a spacious eyrie of sticks and twining branches, laid nearly flat, and lined with a thick layer of hair inartificially disposed. The female lays two eggs, much pointed at one extremity, and dotted and spotted with crimson on a ground of brownish-red.

The Caracara devours the dead and the living. Sometimes four or five unite to pursue a prey that a single one could not master. D'Azara states that he has seen them hunt down red buzzards, herons, and other large birds; and it seems they prey, not only on a variety of smaller creatures, but also on young fawns and lambs. Often do they feast, too, on what others have taken. Thus, if a caracara sees a vulture devour a piece of flesh, it will pursue him, and compel him to disgorge it; and the sportsman is not unfrequently foiled by this bird coming and bearing off the game before his eyes.

In the Second Family of Raptorial Birds,* zoologists consider the destructive energy to be most perfectly developed. Here natural instruments are found for striking, trussing, and dissecting their prey, combined with a great power of flight and strength of limbs, adapted to triumph over the prey, whether it be aerial—struck in its flight, or whether it be terrestrial—captured on the ground.

It is not improbable that similar habits of solitude in the lion and the eagle, together with their magnitude and strength, have given rise to their titles, so generally current, of king of beasts—king of birds. Jonston says, in an old work, "Englished by a Person of Quality:"—"The eagle challengeth the first place, not that it is the best dish at table, for none will eat it, but because it is the king of birds." The ancient Greeks were of the same opinion, for Pindar speaks of "the great eagle, the chief magistrate of the birds." This great eagle, or imperial eagle, was sometimes confounded with other species, but it is of a larger, stronger, and more noble description than any other variety. Josephus says, the eagle was selected for the Roman legionary standard, because "he is the king of all the birds, and the most powerful of them all, whence he has become the emblem of empire and the omen of victory." An eagle, in ancient mythology, was alone thought worthy to bear the thunder of Jupiter. The plume of this noble bird is chosen by the young Indian warrior as his highest ornament; and, without it, even the garb of the Highland chieftain is considered incomplete.

Dignity and majesty are the common attributes of the eagle. Hence Mrs. Hemans, addressing one of these birds who has been fatally wounded, thus speaks:—

"Eagle! this is not thy sphere!
Warrior-bird, what seek'st thou here?
Wherefore by the fountain's brink
Doth thy royal pinion sink?
Wherefore on the violet's bed
Lay'st thou thus thy drooping head?
Thou, that hold'st the blast in scorn,
Thou, that wear'st the wings of morn!

"Eagle! wilt thou not arise?
Look upon thine own bright skies!
Lift thy glance! the fiery sun
There his pride of place has won,
And the mountain lark is there,
And sweet sound hath fill'd the air;
Hast thou left that realm on high?—
Oh, it can be but to die!

"Eagle! Eagle! thou hast bowed!
From thine empire o'er the cloud!
Thou that hadst ethereal birth,
Thou hast stoop'd too near the earth,
And the hunter's shaft hath found thee,
And the toils of Death have bound thee—
Wherefore didst thou leave thy place,
Creature of a kingly race?

"Wert thou weary of thy throne?
Was the sky's dominion lone?
Chill and lone it well might be,
Yet that mighty wing was free!
Now the chain is o'er thee cast:
From thy heart the blood flows fast—
Woe for gifted souls and high!
Is not such their destiny?"

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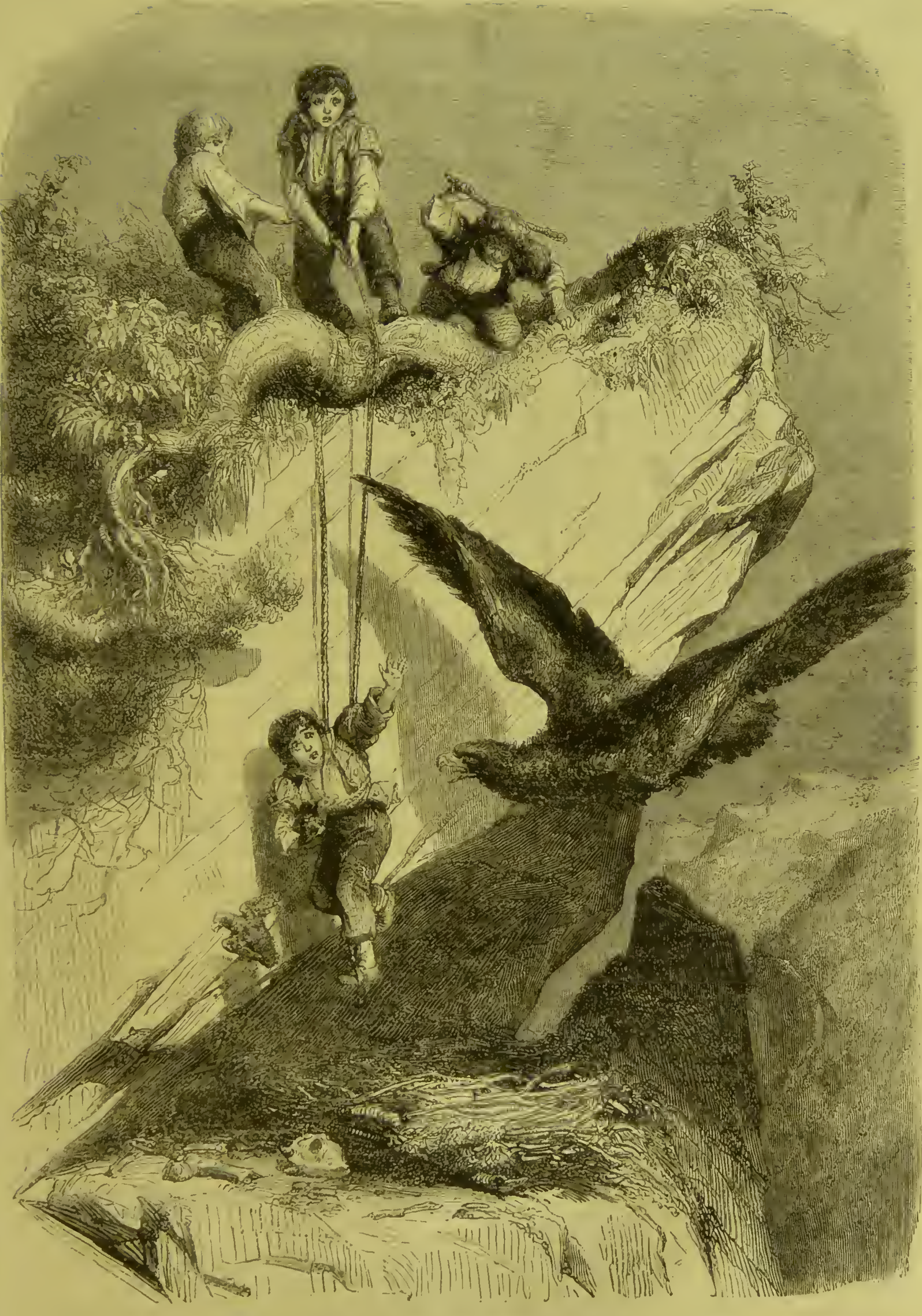
* Falconidæ: Leach.



CHILDREN ROBBING AN EAGLE'S NEST ATTACKED BY THE PARENT BIRD.

The vulture, on the other hand, instead of being regarded as a symbol of "high and gifted" spirits, is only taken as the type of degraded and ferocious humanity. If the one is lauded for an imperial bravery and generosity, the other is branded as base, cowardly, and obscene. Here, however, is a manifest injustice. Eagles, adapted to seize and carry off their living prey, are useful in checking the increase of the smaller kinds of quadrupeds and birds, which would otherwise become too numerous; while vultures, not organised for this task, are no less usefully employed in removing the carrion, whose exhalations would occasion disease and death. Each class exercises its peculiar instincts, for which an express provision is made in its structure, and confers important benefits on man: one should not, therefore, be exalted at the expense of the other; and, whenever it is, another instance appears of the prejudice by which utility is valued chiefly on account of its gaudy accessories.

The eagle, like the falcon and the hawk, refuses, unless compelled by necessity, to taste other food than that they themselves have procured; they rend the quivering fibres of their expiring victim, and drink the blood warm from its gushing veins. The eye of the eagle glares defiance and a dauntless daring: the beak is deep, strong, and curved, the point bending into a short and formidable hook; the legs, short and robust, are covered with rough, hard scales; the toes, too, are also thus protected; but, above all, they are armed with enormous hooked and sharp-pointed talons. It is these that the eagle plunges deep into the agonised body of his prey as he proceeds to lacerate it with his beak, and it is in their grasp that he bears off the fawn, the lamb, or the wild fowl, to his lonely eyrie; for it is seldom that the eagle—and it is so with the falcon and the hawk—attempts to satiate his hunger on the spot, unless the animal is too heavy to be carried away. We have a fine specimen in the imperial eagle (p. 33).

The Abbé Spallanzani had a common, or black eagle, which was so powerful, that it could easily kill dogs much larger than itself. When a dog was cruelly forced into the room where the eagle was kept, it immediately ruffled the feathers on its head and neck, taking a short flight, alighted on the back of its victim, held the neck firmly with one foot, so that there could be no turning of the head to bite, while one of the flanks was grasped with the other, and in this attitude the eagle continued, till the dog, with fruitless cries and struggles, expired. The beak, hitherto unemployed, was now used to make a small hole in the skin: this was gradually enlarged, and from it the eagle tore away and devoured the flesh. This bird never ate any skin or intestine, and rarely bone.

Thus ferocious and violently impetuous in attacking animals, it never molested man. The Abbé, who constantly fed it, could safely enter the apartment where the eagle was kept, and witness such assaults without any personal apprehension; nor did it discover the slightest shyness while he remained. In general, when it had flesh at will, it made only one meal a-day. The Abbé found, by weighing what it ate, that thirty ounces of flesh were amply sufficient, one day with another.

M. Ebel relates that a young hunter in Switzerland, having discovered an eagle's nest, killed the male, and was descending the rocks to destroy what remained, when, at the moment he was putting his hand into the cleft to take the nest away, the mother, indignantly pouncing upon him, fixed her talons in his arm, and her beak in his side. With great presence of mind, the hunter stood still; had he moved, he would have fallen to the bottom of the precipice; but now, holding his gun in one hand, and supporting it against the rock, he took his aim, pulled the trigger with his foot, and shot the eagle dead. The wounds he had received confined him to his bed, however, for six weeks. A somewhat similar story is related of the children of a Scottish peasant, who were surprised, in their endeavour to take away some young eaglets from the nest, by the return of the mother, from whose indignation they had great difficulty in escaping.

A peasant, with his wife and three children, took up his summer quarters in a châlet, and pastured his flock on one of the rich Alps that overlook the Dranse. The eldest boy was an idiot, about eight years of age; the second, five years old, but dumb; and the third, an infant. One morning the idiot was left in charge of his brothers, and the three had wandered to some distance from the châlet before they were missed; and, when the mother found the two elder, she could discover no trace of the babe.

A strange contrast was presented by the two children: the idiot seemed transported with joy, while his dumb brother was filled with consternation. In vain did the terrified parent attempt to gather from either what had become of the infant. But, as the idiot danced about in great glee, laughed immoderately, and imitated the action of one who had caught up something of which he was fond, and hugged it to his breast, the poor woman was slightly comforted, supposing that some acquaintance had fallen in with the children, and taken away the babe.

But the day and the succeeding night passed without any tidings of the lost one. On the morrow the parents were earnestly pursuing their search, when, as an eagle flew over their heads, the idiot renewed his gesticulations, and the dumb boy clung to his father with frantic shrieks. Now the dreadful thought broke upon their minds that the infant had been carried off by a bird of prey, and that his half-witted brother was delighted at his riddance of an object which had excited his jealousy.

Meanwhile, an Alpine hunter had been watching near an eyrie, hoping to shoot the mother-bird, on returning to her nest. At length, waiting with the anxious perseverance of such determined sportsmen, he saw her slowly winging her way towards the rock, behind which he had taken refuge, when, on her nearer approach, he heard, to his horror, the cries of an infant, and then beheld it in her frightful grasp. Instantly his resolve was made, to fire at the eagle the moment she should alight on the nest, and rather to kill the child than leave it to be devoured. With a silent prayer, arising from his heart of hearts, he poised, directed, and discharged his rifle; the ball went through the head or breast of the eagle; with indescribable delight he bore the babe away; and, within four-and-twenty hours after it was missed, he had the satisfaction of restoring it—with wounds which were not serious, on one of its arms and sides—to its transported mother's bosom.

Other instances are recorded of children being seized and carried off by eagles to their young. In the year 1737, in the parish of Norderhougs, in Norway, a boy, somewhat more than two years old, was running from the house to his parents, who were at work in the fields not far off, when an eagle pounced upon him, and flew off with him in their sight, while all their screams and efforts were in vain. Anderson says, in his "History of Iceland," that, in that island, children of four or five years old have been taken away by eagles; and Ray relates, that, in one of the Orkneys, a child was seized in the talons of an eagle, and borne above four miles to its nest. The mother, knowing the eyrie, went thither, clomb up the mountain, discovered her child, and took it away unarmed.

Sir Robert Sibbald, in his account of the Orkneys, gives, among other instances, the following:—An eagle seized a child a year old, which its mother had left, wrapped up in some clothes, at a place called Houton-Head, while she went for a few moments to gather sticks for firewood, and carried it a distance of four miles to Hoia; which circumstance being known from the cries of the mother, four men went there in a boat, and, knowing where the nest was, found the child unhurt. This story seems to have furnished the groundwork of the affecting tale in "Blackwood's Magazine" of "Hannah Lamont's Bairn."

THE GOLDEN EAGLE.*

A POET has truly said—

"The tawny eagle seats his callow brood
High on the cliff, and feasts his young with blood;
On Snowdon's rocks, or Orkney's wide domain,
Whose beetling cliffs o'erhang the western main,
The royal bird his lonely kingdom forms
Amidst the gathering clouds and sullen storms;
Through the wide waste of air he darts his sight,
And holds his sounding pinions poised for flight;
With cruel eye premeditates the war,
And marks his destined victim from afar:
Descending in a whirlwind to the ground,
His pinions like the rush of waters sound;
The fairest of the fold he bears away,
And to his nest compels the struggling prey;
He scorns the game by meaner hunters tore,
And dips his talons in no vulgar gore."

In England and the south of Scotland the Golden Eagle may be accounted rare, very few of their districts being adapted to its disposition, or to the rearing of its young. Some parts of Derbyshire, the mountainous parts of Wales, and the precipices of Cumberland and Westmoreland, are said to have once boasted of eyries. Upon the wild ranges of the Scottish Border one or two pairs used to breed, but their nest has not been known for many years, though a straggler, in winter, may sometimes be seen amidst their defiles. It is not till the Highlands of Scotland are really entered by one of their grand and romantic passes, that this majestic bird can be said really to occur; and it is not till the very centre of their wildness is reached that it can be frequently seen. But the species must be gradually, though surely, decreasing; for such have been its ravages among the flocks during the season of lambing—the time when a large supply of food is required by the parent birds for their young—that every device has been employed, and expense incurred by rewards, for their destruction. From March, 1831, to March, 1834, in the county of Sutherland alone, one hundred and seventy-one old birds, with fifty-three young and eggs, were destroyed, showing that the eagle is not of the extreme rarity that is sometimes supposed; and also, that, if the war of extermination be continued, the northern landscape will soon lose this appropriate ornament.

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* Aquila chrysaetos.

Its loss from the Highland districts is thus lamented by a naturalist:—"How picturesque the eagle looks, and how perfectly he represents the *genius loci*, as, perched on some rocky point or withered tree, he sits unconcerned in wind and storm, motionless and statue-like, with his keen, stern eye, however, intently following every movement of the shepherd or of the sportsman, who, deceived by his apparent disregard, attempts to creep within rifle-shot! Long before he can reckon on reaching so far with his bullet, the bird launches himself into the air, and, gradually sweeping upwards, wheels high out of shot, leaving his enemy disappointed and vexed at having crept in vain through bog and over rock in expectation of carrying home so glorious a trophy of his skill. When intent on his game, the eagle frequently will venture within a short distance ot the grouse-shooter or deer-stalker. I have seen him pounce (no, that is not the proper word, for he rather rushes) down on a pack of grouse, and, with outspread wings, he so puzzles and confuses the birds, that he seizes and carries off two or three before they know what has happened, and in the very face of the astonished sportsman and his dogs. The mountain hare, too, is carried off by the eagle with as much apparent ease as the mouse is borne away by the kestrel."

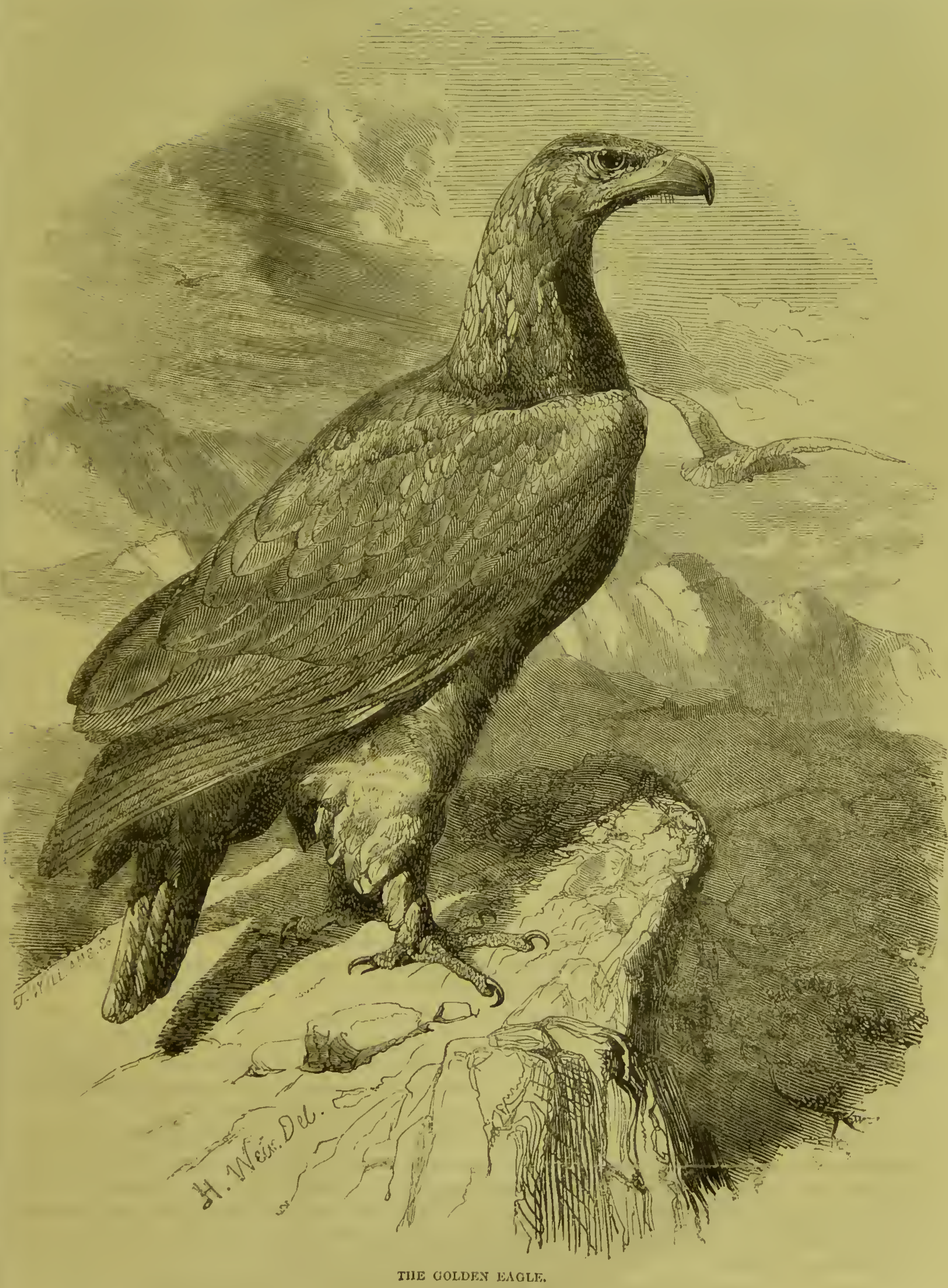
In Ireland, the golden eagle is generally distributed where the situations are favourable; but, at the same time, it is much more rare than the sea eagle. The Horn Head, the mountain of Rosheen, near Dunfanaghy, Achill Island, and Crowpatric are mentioned by Mr. Thompson as recently or formerly having eyries on their precipices; but from Rosheen they have been driven off, from the destruction done to the flocks. The nest, placed on a ledge perfectly inaccessible, was set on fire by burning a lighted brand, and was consumed with its tenants. The parents afterwards forsook a station where they had been attacked in so unusual a manner.

The distribution of this species extends over the northern parts of Europe, but towards the south the golden eagle becomes less frequent. It also inhabits North America, but appears to be there generally rare; although, according to Audubon, an excellent authority, it is frequently seen in the United States. In the fur countries it again becomes scarce; and the naturalist just mentioned saw a single specimen only on the coast of Labrador, "sailing at the height of a few yards above the moss-covered surface of the dreary rocks."

In a wild state, the plumage attains its maturity nearly by the third year, though the colours of the base of the tail darken considerably after that period. In confinement, it often does not take place fully until the fourth or fifth year; and a female which was kept from the nest for six years had the base of the tail feathers, in the intervals between the dark bars, remarkably pure.

The colours of the adult birds are generally a deep and rich umber brown, glossed with purple on the back and wings; on the hind head and back of the neck, the feathers are of a hackled, or lanceolate, form, pale orange brown, occasionally edged with a paler tint; and, when shone upon by the sun, or a strong light, have a brilliant, and almost golden appearance, whence the name of these birds is derived. The fronts of the thighs, shoulders, and tarsi are of the same pale orange-brown colour. The quills are blackish brown, nearly black, white towards the base on the inner webs, and clouded with grayish black. The secondaries are clouded with hair brown, brocoli brown, and umber brown. The tail, with the exception of the centre feathers, is nearly square; these are narrowed toward the point, and exceed the others in length—a form which prevails considerably in the true eagles, and is greatly developed in the New Holland wedge-tailed eagle.

The colour of the tail is grayish brown, palest, and almost approaching to white, on the base ot the inner webs; only the whole appears very dark, from the crowded arrangement of the dark markings; these are of very deep umber, or blackish brown, disposed in bars across, and irregular clouding in the intervals. In the young birds, the terminal band is always present; but the base of the whole tail is pure white, which is gradually obliterated by the occurrence of additional bars and



THE GOLDEN EAGLE.

clouded markings year after year, commencing, at first, immediately above the terminal bar, and gradually ascending and becoming closer as their age advances. White also predominates on the other parts of the plumage; the quills and secondaries have a much greater proportion at the base, and there is a similar distribution, in greater or less proportions, in the roots of the feathers over the whole body, which, as with the tail, is lost and obscured by the gradual occurrence of bars and cloudings. The irides of the young birds are dark, but, with age, grow paler, and become a clear orange-brown. The colours of the cere and legs, from greenish-yellow, assume a pure gamboge tint.

The eyrie of the golden eagle is placed on the face of some stupendous cliff situated inland; the nest is built on a projecting shelf, or on some stumped tree that grows from the rock, generally in a situation perfectly inaccessible without some artificial means, and often out of the reach of shot, either from below, or from the top of the precipice. It is composed of rude materials, as dead branches and roots of heather, in considerable quantity, entangled strongly together, but without any lining in the inside. The eggs are two in number, white, with pale brown or purplish blotches, most numerous and largest at the thicker end. During the season of incubation, the quantity of food that is procured and brought hither is scarcely credible; it is composed of nearly all the inhabitants, or their young, of those wild districts called forests, which, though indicating a wooded region, are often tracts where a tree is not seen for miles around. Hares, lambs, and the young of deer and roebucks, grouse, black game, ptarmigan, curlews, and plovers all contribute to the feast.

Eagles hunt or survey the ground by soaring above, often to an immense height; the ascent is made by circles of beautiful appearance. When the prey is perceived, it is rushed upon by an instantaneous sweep; and, surprised before it can escape, or paralysed by terror, it is generally seized at once. The weight of the birds, and the great resistance presented to the air by their large bodies and expansive wings, prevent pursuit being often tried, though instances of it have been mentioned. Thus, Montague relates one, where a wounded grouse was seized before the guns could be re-loaded; and another, where a black cock was sprung and instantly pursued; "the eagle," he says, "making several pounces in our view, but without success."

Mr. Thompson states that an eagle was seen in pursuit of a hare. The poor animal took refuge under every bush that it could find, which, as often as she did, the eagle approached the bush so near as apparently to beat the top of it with its wings, and thereby forced the hare to leave her place of refuge. In this way she was eventually driven to open ground, which did not long avail, as the eagle soon came up with her, and bore her away.

A party being out hunting among the Belfast mountains, an eagle appeared above the hounds as they came to fault on the ascent to Devis, the highest of the chain. As they went on the scent again, and were at full cry, the eagle, for a short time, kept above them, but at length advanced, and carried off the hare, when at the distance of from three to four hundred paces before the hounds.

The golden eagle is easily kept in confinement, becomes tame, and even familiar with its keeper. Mr. Thompson thus writes:—"My friend, Richard Langtry, Esq., of Fortwilliam, near Belfast, has at present a bird of this species, which is extremely docile and tractable. It was taken last summer from a nest in Inverness-shire, and came into his possession about the end of September. This bird at once became attached to its owner, who, after having it about a month, ventured to give it liberty—a privilege which was not abused, as it came to the lure whenever called.

"It not only permits itself to be handled in any way, but seems to derive pleasure from the application of the hand to the legs and plumage. This eagle was hooded, after the manner of the hunting-hawks, for some time, but the practice was abandoned; and, although it may yet be requisite, if the bird be trained for the chase, hooding is otherwise unnecessary, as it remains quiet and contented for any length of time, and no matter how far it is carried on its master's arm.

"When this eagle is at large, my friend has only to hold out his arm towards it, which, as soon as perceived, even from a distance, it flies to and perches on. It is more partial to alighting on trees than the sea eagles, which are kept also, and, stationed on their tops, keeps its master in view, following him about the demesne, and, where plantations often intervene, flying from one to another in the direction he walks, indolently remaining as long as possible where it perches, consistently with keeping him in sight."

That this bird can revenge itself for an injury, is shown by the following fact:—A gentleman who lived, some years ago, in the south of Scotland, had a tame eagle, which the keeper, one day, for some petty fault, lashed with a horse-whip. About a week after, the man chanced to stoop within reach of its chain, when the enraged bird, recollecting the late injury, flew in his face with so much fury and violence, that he was terribly wounded, yet luckily driven so far back by the blow as to be out of all further danger. The screams of the eagle alarmed the family, who found the keeper lying at some distance in a bloody plight, and stunned alike by the fright and the fall. The eagle was still pacing about, screaming and threatening further evil. It was even dreaded whether, in so violent a rage, he might not break loose; which, providentially for them, he did, just as they withdrew, and escaped for ever."

The attention of the parent bird to her eaglets has often been noticed. Sir Humphry Davy

THE ROYAL EAGLE.* A VARIETY OF THE GOLDEN EAGLE.

had an opportunity of witnessing the instructions given, and thus records the fact:—"I once saw a very interesting sight above one of the crags of Ben Nevis, as I was going in the pursuit of black game. Two parent eagles were teaching their offspring—two young birds—the manœuvres of flight. They began by rising from the top of the mountain, in the eye of the sun. It was about mid-day, and bright for this climate. They at first made small circles, and the young birds imitated them. They paused on their wings, waiting till they had made their first flight, and then took a second and larger gyration, always rising towards the sun, and enlarging their circle of flight, so as to make a gradually ascending spiral. The young ones still slowly followed, apparently flying better as they mounted; and they continued this sublime exercise, always rising, till they became mere points in the air, and the young ones were lost, and afterwards their parents, to our aching sight."

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* Aquila Regia.

THE WEDGE-TAILED EAGLE.*

THIS bird, which may be regarded as the type of a distinct form, agrees generally with the genuine eagles of the Old World, and more particularly in the lengthened wings and feathered legs, but the middle feathers of the tail exceed the outermost by about four inches; hence it has a wedge-shaped tail, from which its name is derived.

What the Golden Eagle is to the northern, the Wedge-Tailed Eagle is to the southern hemisphere. Universally spread over that portion of Australia, numerous in Van Diemen's Land, and on the larger islands of Bass's Straits, Mr. Gould—one of our most distinguished naturalists—thinks that it will, in all probability, be found to extend its range as far towards the tropics in the south as the golden eagle does in the north.

Mr. Gould killed one that measured six feet eight inches in the spread of its wings, and weighed nine pounds; but he believed he had seen much larger specimens. Its piercing eye detects and marks, as it wheels aloft, circling gracefully, its victims—generally consisting of the smaller kangaroos—when down it comes with full and unerring swoop. That these quadrupeds were more abundant in the olden time, appears from the account given by Captain Flinders, of Kangaroo Island. On one occasion, he says:—"I had with me a double-barrelled gun, fitted with a bayonet, and the gentlemen—my companions—had muskets. It would be difficult to guess how many kangaroos were seen; but I killed ten, and the rest of the party made up the number to thirty-one, taken on board in the course of the day—the least of them weighing sixty-nine, and the largest one hundred and twenty-five pounds"—which the Captain, having some misgivings, subsequently describes as "butchery." The bustard, whose weight is twice that of the wedge-tailed eagle, is not safe from its attacks, and even the emeu is mentioned as its prey. It is, too, the scourge of the shepherds and stock-owners, where the kangaroo formerly abounded, and makes terrible havoc with the lambs. Not that carrion is despised; for Mr. Gould, during one of his journeys into the interior to the northward of Liverpool Plains, saw no less than thirty or forty assembled together around the carcase of a dead bullock: some, gorged to the full, perched upon the neighbouring trees, while the rest were still engaged in their banquet. He adds, that, for the sake of the refuse thrown away by the kangaroo hunters, it will often follow them for many miles, and even for days together.

The nests observed by the same sagacious naturalist, and placed in the most inaccessible trees, were very large, nearly flat, and built of sticks and boughs; but the eggs he could never procure. The one in the Zoological Gardens, however, laid an egg, according to Mr. Broderip, on the 27th of February, 1850. On the 28th it was placed under a common hen, which sat very close, but fruitlessly, and on the 21st of March the addled egg was removed. On the 4th of March she laid a second egg: on the 29th, a third egg was produced and destroyed by the parents; and on the 4th of April another egg was laid, but no attempt was made to get it hatched.

"The imprisoned parents," adds Mr. Broderip, "made a poor apology for a nest of birch-broom and straw—the materials within their reach; but, instead of manifesting any intention to do the parental office, the birds wanted to destroy every one of the eggs; and the keeper found it necessary to look very sharp to prevent them from carrying their ovicidal propensities into effect.

"This reversal of the great law of Nature is not confined to birds. The sow and the rabbit, if disturbed at the critical moment, will not unfrequently devour their offspring—as those know, to their cost, whose impatience has brought their prying eyes to look into the mystery. We forget that, in their natural state, the first care of all vertebrated animals is to hide their eggs or young. The same may be said of insects, crustaceous, and even of molluscous animals. In proportion as the organisation is developed, the sensitiveness to the violation of this principle increases. The quadruped, in a state of morbid irritation, devours its young; the bird forsakes its nest, or destroys its eggs."

A wedge-tailed eagle, captured by Captain Waterhouse, in an excursion to Broken Bay, in New South Wales, gave proof of its strength by forcing its talons through a man's boot, while lying at the bottom of a boat with its legs tied together. During the ten days it was a captive, it refused to be fed

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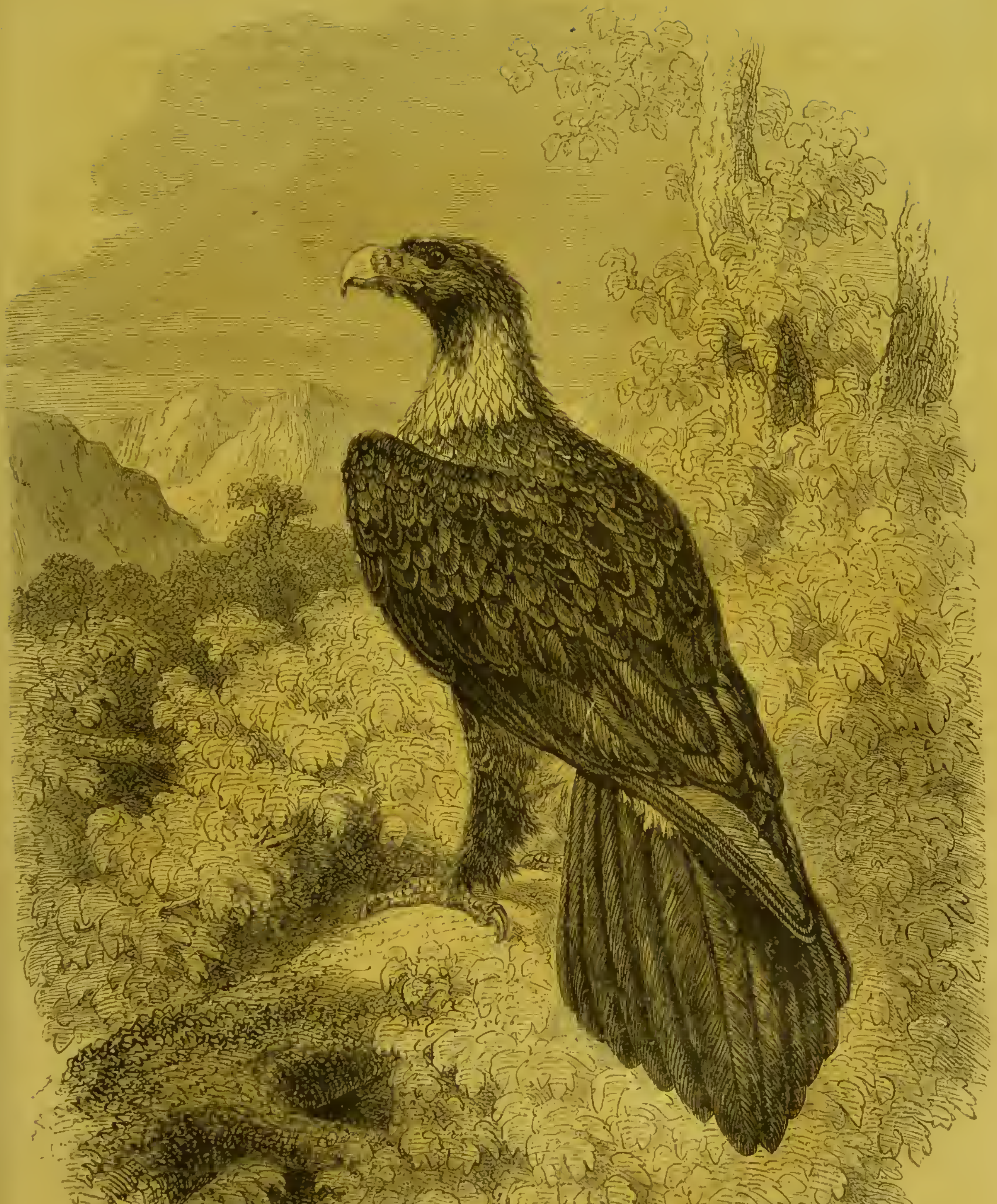
* Aquila Fucosa: Cuvier.



THE WEDGE-TAILED EAGLE.

by any except one particular person. But its patience was then gone; for, one morning, it was found to have divided the strands of the rope by which it was fastened, and to have made its escape.

A less noble, as well as a less typical group, is formed of the sea eagles, receding, as they do, considerably from the true eagles in organisation and habits. All of them have a greater or lesser tendency to change the colour of their plumage as age increases, evincing in this, as well as in other respects, an approximation to certain South American groups, in which those parts are feathered in the young state and denuded in maturity; and through them, to the vultures, in which the head and neck, during all stages of their growth, are covered with a silky down. Inhabiting, most commonly, the sea-coast or the banks of the larger rivers and inlets, they prey chiefly on fishes and aquatic birds, usually carrying them off to be devoured on the rocks or in their nests. Occasionally, when other resources fail, they fasten on the dead carcases of animals, remaining stationary for hours, and even for days, upon the putrid carrion, and quitting it only when it fails to glut their ravenous appetites.

THE GREAT SEA EAGLE.*

This bird is found through nearly the whole of Europe and of northern Asia, building its nests in the rocky clefts, and, more frequently, on the summit of some lofty tree. Here the female lays two eggs, about the same size and shape as those of a goose; and the young are reared on fish or flesh, until they are able to sally forth with their parents in quest of prey, when they speedily assume an independent course.

THE BIRD OF WASHINGTON.†

Audubon, the celebrated naturalist, was, on a winter's evening, in a vessel ascending the Upper Mississippi, when the keen blast that whistled over the heads of the voyagers, and the cold from which he personally suffered, almost extinguished the interest which, at other times, this river had awakened in his mind. He lay stretched beside the patroon, the safety of the cargo was forgotten, and the only thing that excited his attention was the multitude of ducks and the vast flocks of swans that were passing onwards. His patroon, a Canadian, a man of much intelligence, and engaged for many years in the fur trade, seemed only anxious to find some new object for Audubon's diversion, when an eagle flew over them. "How fortunate!" he exclaimed; "this is what I could have wished. Look, sir! it is the great eagle, and the only one I have seen since I left the lakes."

Instantly Audubon was on his feet, and, having observed it attentively, concluded, as it became lost in the distance, that it was a species quite new to him. His patroon assured him that such birds were rare; that they sometimes followed the hunters, to feed on the carcases of the slain animals, when the lakes were closed by the ice; but when open, they would dive, in the day time, after fish, and snatch them up in the manner of the fish-hawk; that they roosted, generally, on the shelves of the rocks on which they built their nests, of which he had discovered several by the quantity of white exuviæ scattered below.

A few years afterwards, Audubon was engaged in collecting cray-fish, in one of those flats which border and divide Green River, in Kentucky, near its junction with the Ohio, from the range of high cliffs which, for some distance, follow the meanders of that stream. Observing, on the rocks, a quantity of white ordure, and thinking that owls resorted thither, he mentioned it to one of his companions; when one of them, who lived near the spot, said it was from the nest of the brown eagle—meaning the young of the white-headed eagle, with which he was acquainted. Audubon assured him that it could not be so, as this species never built in such places, but only in trees; when his companion, though unable to meet his objection, stoutly maintained that a brown eagle, above the usual size, had built there; that he had espied the nest some days before, and had even seen one of the old birds dive and catch a fish. This he thought strange, having, till then, always observed that brown and white-headed eagles procured this kind of food by robbing the fish-hawks; and added, that, if Audubon was anxious to know what nest it was, he might soon satisfy himself, as the old birds would certainly come and feed their young with fish, as they had done before.

In high expectation, the naturalist seated himself about a hundred yards from the foot of the rock. Never did time pass more slowly; nor could he help betraying the most impatient curiosity; for his hopes whispered that the great eagle was about to appear, of which he had a glance on the Upper Mississippi. Two long hours elapsed before the old bird made his appearance, which was announced by the loud hissings of two young ones, who crawled to the extremity of the abode, to receive a fine fish. He had a perfect view of this noble bird, as he held himself to the edging rock, with his tail spread, and his wings partly so, and hanging something like the bank-swallow.

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* Falco Albicilla.

† Falco Washingtoniensis.

Audubon trembled, lest a word should escape from his companions; but they entered into his feelings so far as to be silent, and, though personally but little interested, gazed with him. In a few minutes the other parent joined her mate, which, from its being so much larger, they knew to be the mother-bird. She, also, had brought a fish; but, more cautious than her mate, her quick and piercing eye glanced around before she alighted, and, instantly detecting the discovery of her procreant bed, she dropped her prey, alarmed the male by a loud shriek, hovered with him over the heads of the observers, and kept up a growling, threatening cry, to intimidate them from their suspected design—a watchful solicitude Audubon had ever found peculiar to the female.

The young having hid themselves, the lookers-on went and picked up the fish which the mother had let fall: it was a white perch, weighing about five pounds and a half; the upper part of the head was broken in, and the back torn by the talons of the eagle, and which they had plainly seen her carrying in the manner of the fish-hawk. The day's sport being now at an end, they agreed to return the next morning, being most anxious to obtain both the old and young birds; but rainy and tempestuous weather setting in, it was the third day before, with men and guns all ready, they reached the rock.

Some posted themselves at its foot, and others upon it, but all in vain. The entire day passed without seeing or hearing an eagle; for the sagacious birds, no doubt anticipating an attack, had gone with their young to fresh quarters. Thus, the expedition which had excited so much hope signally failed.

Two years elapsed since the discovery of the nest, in fruitless excursions, when Audubon, returning from the little village of Henderson to the house of Dr. R——, about a mile distant, saw an eagle rise from an inclosure not a hundred yards before him, where the Doctor had, a few days before, slaughtered some hogs, and there alight upon a low tree branching over the road. He prepared his double-barrelled piece, which he constantly carried, and went slowly and cautiously towards him; but, quite fearless, the eagle waited his approach, and looked on him with an undaunted eye. At the first fire he fell, and, before he could be reached, was dead. "With what delight," says Audubon, "I surveyed this magnificent bird! . . . . Not even Herschel, when he discovered the famous planet that bears his name, could have experienced more happy feelings; for, to have something new to relate, to become yourself a contributor to science, must excite the proudest emotions of the human heart. I ran and presented the bird to my friend, with a pride that those only can feel who, like me, have devoted their earliest childhood to such pursuits, and have derived from them their first of pleasures; to others, I must seem 'to prattle out of fashion.' The Doctor, who was an experienced hunter, examined the bird with much satisfaction, and frankly acknowledged he had never before seen or heard of it. The name I chose for this new species of eagle was the 'Bird of Washington,' from its being indisputably the noblest of the genus known to naturalists."

Audubon subsequently verified the account of this bird, given by his patroon on the Upper Mississippi, as he felt particularly anxious to learn its habits, and in what respects it differed from the rest of the genus. "In the United States," he says, "from Massachusetts to Louisiana, on the sea-board, or as high as the mouth of the Missouri to the north-west (I speak only of the extent of country I have visited, and where I have seen them), these birds are very rare. This will appear to all, when I say, that, during my many long peregrinations, I never found more than eight or nine, and only one nest."

THE WHITE-HEADED SEA EAGLE.*

THOUGH in the early stages of its growth there is little to distinguish this bird from the young of the Great Sea Eagle, the difference is clearly manifest in after-life, in the pure whiteness of its head and neck, from which it has been popularly, but erroneously, called the "Bald Eagle."

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* Haliæetus Leucocephalus.

The plumage continues of a brown gray until the third year, when the white begins to appear on the head, neck, tail-coverts, and tail, and they are nearly, if not completely, white by the end of the fourth year. As, too, the head becomes whitened, the eye, at first hazel, acquires a brilliant straw-colour.

Meanwhile, the upper parts of the body present a mixture of brown and dirty-white, the separate feathers having a ground of the latter hue, and being deeply tipped and broadly barred with the former. The quill-feathers and primary wing-coverts are black, with their shafts of a pale brown; the secondary are considerably lighter; and the tail, which slightly projects beyond the extremities of the wings, is brown on the outer quills, and of a mixed white and brown on the inner. The under surface, as far backward as the middle of the belly, is of a dull white, with numerous broad streaks of pale brown; on

THE SEA EAGLE.

the hinder part it is of a deep brown, the feathers being only slightly margined with white. A similar hue prevails on the upper parts of the legs, which are plumed somewhat below the knees. The beak is of a dusky brown; the cere and legs of a golden yellow; the iris somewhat lighter; and the talons deep blackish-brown, long, sharply curved, of considerable power, and extremely sharp at the points. Fully grown, this eagle measures upwards of three feet from beak to tail, and more than seven in the expanse of its wings.

This bird is common to both continents, and is occasionally met with from a high northern latitude to the borders of the torrid zone, but chiefly in the vicinity of the sea, and along the shores and cliffs of lakes and large rivers. Formed for braving the severest cold; feeding alike on the produce of the sea and the land; capable of outstripping in its flight the fury of the tempest; unawed by nothing but man; and, from the ethereal heights to which it soars, looking at a glance on an immeasurable expanse of ocean, as well as of forests, fields, and lakes, far below, it appears indifferent to the change of season on little localities; as, in a few minutes, it can pass from summer to winter, from the lower to the higher regions of the atmosphere—the abode of constant cold—and thence descend at will to the torrid or the frigid regions of the globe. The White-Headed Eagle is, therefore, found in all seasons in the countries where it dwells, but prefers the localities in which it can banquet on fish.

It would appear that this eagle is partial to the vicinity of cataracts, great numbers of them frequenting the Falls of Niagara; and, in Lewis and Clark's expedition, we meet with the following account of one of their nests, which must have added not a little to the picturesque effect of the magnificent scenery at the falls of the Missouri:—"Just below the pitch," say these travellers, "is a little island in the middle of the river well covered with timber. Here, on a cotton-wood tree, an eagle had fixed its nest, and seemed the undisputed mistress of the spot, to contest whose dominion neither man nor beast would venture across the gulfs which surround it, and which is further secured by the mists rising from the falls."

"In the month of May," says Wilson, "while on a shooting excursion along the sea-coast, not far from Great Egg Harbour, accompanied by my friend, Mr. Ord, we were conducted about a mile into the woods to see an eagle's nest. On approaching within a short distance of the place, the bird was perceived slowly retreating from the nest, which, we found, occupied the centre of the top of a very large yellow pine. The woods were cut down, and cleared off for several rods around the spot, which circumstance gave the stately, erect trunk, and large, crooked, wriggling branches of the tree, surmounted by a black mass of sticks and brush, a very singular and picturesque effect. Our conductor had brought an axe with him to cut down the tree; but my companion, anxious to save the eggs, or young, insisted on ascending to the nest, which he fearlessly performed, while we stationed ourselves below, ready to defend him, in case of an attack from the old eagles. No opposition, however, was offered; and, on reaching the nest, it was found, to our disappointment, empty. It was built of large sticks, some of them several feet in length; within it lay sods of earth, sedge, grass, dry reeds, &c., piled to the height of five or six feet, by more than four in breadth; it was well lined with fresh pine-tops, and had little or no concavity. Under this lining lay the recent exuviæ of the young of the present year, such as scales of the quill, feathers, down, &c. Our guide had passed this place late in February, at which time both male and female were making a great noise about the nest; and, from what we afterwards learnt, it is highly probable it contained young, even at that early time of the season."

The white-headed eagle commonly obtains food by snatching from the fish-hawk—a variety of the osprey—the hard-earned morsel for which the latter has watched in vain. "Elevated," says Wilson, "on the high, dead limb of some gigantic tree that commands a wide view of the neighbouring shore and ocean, he seems calmly to contemplate the motions of the various feathered tribes that pursue their busy avocations below; the snow-white gulls slowly winnowing the air; the busy tringæ coursing along the sands; trains of ducks streaming over the surface; silent and watchful cranes, intent and wading; clamorous crows, and all the winged multitudes that subsist by the bounty of this vast liquid magazine of Nature. High over all these hovers one whose action instantly arrests his attention. By his wide curvature of wing and sudden suspension in the air, he knows him to be the fish-hawk, settling over some devoted victim of the deep. His eye kindles at the sight, and, balancing himself with half-opened wings on the branch, he watches the result.

"Down, rapid as an arrow from heaven, descends the distant object of his attention, the roar of its wings reaching the ear as it disappears in the deep, making the surges foam around! At this moment, the eager looks of the eagle are all ardour; and, levelling his neck for flight, he sees the fish-hawk once more emerge struggling with his prey, and mounting in the air with screams of exultation. These are the signals for our hero, who, launching into the air, instantly gives chase, and soon gains on the fish-hawk; each exerts his utmost to mount above the other, displaying in these *rencontres* the most elegant and sublime aerial evolutions. The unincumbered eagle rapidly advances, and is just on the point of reaching his opponent, when, with a sudden scream, probably of despair, and honest execration, the latter drops his fish; the eagle, poising himself for a moment, as if to take a more certain aim, descends like a whirlwind, snatches it in his grasp, ere it reaches the water, and bears his ill-gotten booty silently away to the woods."

Sometimes, however, the fish-hawks assemble in bands too numerous for the eagle to encounter, and he is driven to hunt for himself. He then usually retires inland, and occasionally destroys great numbers of young pigs and lambs. At other times, he contents himself with fowl; and ducks, geese, and gulls fall victims to his insatiable appetite.

A vivid picture of the eagle, in such circumstances, has also been painted by the pencil of Audubon:—

"To give you," he says, "some idea of the nature of this bird, permit me to place you on the Mississippi, on which you may float gently along, while approaching winter brings millions of water-fowl, on whistling wings, from the countries of the north, to seek a milder climate in which to sojourn for a season. The eagle is seen perched in an erect attitude on the highest summit of the tallest tree, by the margin of the broad stream. His glistening but stern eye looks over the vast expanse; he listens attentively to every sound that comes to his quick ear from afar, glancing now and then on the earth beneath, lest even the light tread of the fawn may pass unheard.

"His mate is perched on the opposite side, and, should all be tranquil and silent, warns him, by a cry, to continue patient. At this well-known call, the male partly opens his broad wings, inclines his body a little downwards, and answers to her voice in tones not unlike the laugh of a maniac. The next moment he resumes his erect attitude, and again all around is silent. Ducks of many species—the teal, the widgeon, the mallard, and others—are seen passing with great rapidity, and following the course of the current; but the eagle heeds them not—they are at that moment beneath his attention. The next moment, however, the wild, trumpet-like sound of a yet distant but approaching swan is heard. A shriek from the female eagle comes across the stream; for, kind reader, she is fully as alert as her mate. The latter suddenly shakes the whole of his body, and, with a few touches of his bill, aided by the action of his cuticular muscles, arranges his plumage in an instant.

"The snow-white bird is now in sight; her long neck is stretched forward; her eye is on the watch, vigilant as that of her enemy; her large wings seem with difficulty to support the weight of her body, although they flap incessantly. So irksome do her exertions seem, that her very legs are spread beneath her tail to aid her flight. She approaches, however. The eagle has marked her for his prey. As the swan is passing the dreaded pair, the male bird starts from his perch, in full preparation for the chase, with an awful scream that to the swan's ear brings more terror than the report of the large duck-gun. Now is the moment to witness the eagle's powers. He glides through the air like a falling star, and, like a flash of lightning, comes upon the timorous quarry, which now, in agony and despair, seeks, by various manœuvres, to elude the grasp of his cruel talons; it mounts, doubles, and willingly would plunge into the stream, were it not prevented by the eagle, which, long possessed of the knowledge that by such a stratagem the swan might escape him, forces it to remain in the air, by attempting to strike it with its talons from beneath.

"The hope of escape is soon given up by the swan. It has already become much weakened, and its strength fails in the sight of the courage and swiftness of its antagonist. Its last gasp is about to escape when the ferocious eagle strikes with his talons the under side of its wing, and, with unresisted power, forces the bird to fall in a slanting direction upon the nearest shore. It is then, reader, that you may see the cruel spirit of this dreaded enemy of the feathered race, whilst, exulting over his prey, he, for the first time, breathes at ease.

"He presses down his powerful feet, and drives his sharp claws deeper than ever into the heart of the dying swan. He shrieks with delight as he feels the last convulsions of his prey, which has now sunk under his unceasing efforts to render death as painfully felt as it can possibly be. The female has watched every movement of her mate, and, if she did not assist him in capturing the swan, it was not from want of will, but merely because she felt full assurance that the power and courage of her lord were quite sufficient for the deed. She now sails to the spot, where he eagerly awaits her, and, when she has arrived, they together turn the breast of the luckless swan upwards, and gorge themselves with gore.

"At other times, when these eagles, sailing in search of prey, discover a goose, a duck, or a swan, that has alighted on the water, they accomplish its destruction in a manner that is worthy of our attention. Well aware that water-fowl have it in their power to dive at their approach, and thereby elude their attempts upon them, they ascend into the air, in opposite directions, over the lake or river on which the object they are desirous of possessing has been observed. Both reach a certain height, immediately after which, one of them glides with great swiftness towards the prey; the latter, meantime, aware of the eagle's intention, dives the moment before he reaches the spot. The pursuer then rises in the air, and is met by its mate, which glides towards the water-bird that has just emerged to breathe, and forces it to plunge again beneath the surface, to escape the talons of this second assailant. The first eagle is now poising itself in the place where its mate formerly was, and rushes anew to force the quarry to make another plunge. By thus alternately gliding, in rapid and oft-repeated rushes, over the ill-fated bird, they soon fatigue it, when it stretches out its neck, swims deeply, and makes for the shore, in the hope of concealing itself among the rank weeds. But this is of no avail; for the eagles follow it in all its motions, and, the moment it approaches the margin, one of them darts upon it."

THE CAPTURED SWAN.

The flight of the white-headed eagle, when taken into consideration with the ardour and energy of his character, is noble and interesting. Sometimes the human eye can just discern him, like a minute speck, moving in slow curvatures, along the face of the earth; at others, he glides along in a direct horizontal line, at a vast height, with expanded and unmoving wings, till he gradually disappears in the distant blue ether.

THE FISH-HAWK, OR OSPREY.*

A NATIVE both of the old and new continents, the Osprey is everywhere a bird of passage. In spring it visits the shores of the larger rivers and lakes of Russia, Germany, and the middle provinces of Europe, and is occasionally seen in England, where it is not suffered to remain in quietude.

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* Falco Haliæetus.

On the arrival of these birds in the northern parts of the United States, in March, they sometimes find the bays and ponds frozen, and experience a difficulty for many days in procuring fish. Yet, no instance is recorded of their attacking birds or inferior land animals, with intent to feed on them, though their great strength of wing, as well as of their feet and claws, would seem to render this easy. But no sooner do they arrive than they wage war on the white-headed eagles, sometimes succeeding, by force of numbers and perseverance, in driving them from their haunts, but seldom or never attacking them in single combat.

Their first appearance is welcomed by the fishermen, as the happy signal of the approach of the vast shoals of herrings, shad, and other members of the finny tribes, that regularly arrive on the American coast. Such is the respect paid to the Fish-Hawk, not only by this class of men, but generally by the whole neighbourhood where it resides, that a person who should attempt to shoot one of them would stand a fair chance of being insulted. Its appearance, indeed, procures it many a benediction from the fisherman, which Wilson, so eminent as an ornithologist, has happily commemorated in the following lines :—

"Soon as the sun, great ruler of the year,
Bends to our northern climes his bright career,
And from the caves of ocean calls from sleep
The finny shoals and myriads of the deep;
When freezing tempests back to Greenland ride,
And day and night the equal hours divide;
True to the season, o'er our sea-beat shore,
The sailing osprey high is seen to soar,
With broad unmoving wing, and circling slow,
Marks each loose straggler in the deep below;
Sweeps down like lightning! plunges with a roar!
And bears his struggling victim to the shore.
The long-housed fisherman beholds with joy
The well-known signals of his rough employ,
And, as he bears his net and oars along,
Thus hails the welcome season with a song:—
THE FISHERMAN'S HYMN.
The osprey sails above the sound,
The geese are gone, the gulls are flying;
The herring shoals swarm thick around,
The nets are launched, the boats are plying;
Yo ho, my hearts! let's seek the deep,
Raise high the song, and cheerily wish her,
Still as the bending net we sweep,
'God bless the fish-hawk and the fisher!'

She brings us fish—she brings us spring,
Good times, fair weather, warmth, and plenty,
Fine stores of shad, trout, herring, ling,
Sheepshead, and drum, and old wives' dainty.
Yo ho, my hearts! let's seek the deep,
Raise high the song, and cheerily wish her,
Still as the bending net we sweep,
'God bless the fish-hawk and the fisher!'

She rears her young on yonder tree,
She leaves her faithful mate to mind 'em;
Like us, for fish, she sails to sea,
And, plunging, shows us where to find 'em.
Yo ho, my hearts! let's seek the deep,
Raise high the song, and cheerily wish her,
Still as the bending net we sweep,
'God bless the fish-hawk and the fisher!'"

The plumage of the fish-hawk is remarkably compact: the wings are very long, and extend considerably beyond the tip of the tail. The general colour of the upper parts is rich glossy-brown, the tail having alternate bands of a light and a darker colour. The upper part of the head and neck are white or yellowish-white, a band of brown passing from the beak down the side of the neck. The under parts are white, with dashes of yellow, before the plumage is fully matured. The entire length is about two feet; the extent of the wings about four feet six or eight inches. The female is full two inches longer, and differs from the male, also, in its colouring. The nest is of very large size, is built in some great tree near the water, and is composed of such a mass of sticks, sea-weed, grass, and other materials, as often to measure four feet across.

On leaving the nest, the osprey usually flies direct till it comes to the sea, then sails around, in easy, curving lines, turning sometimes in the air as on a pivot, apparently with no exertion, rarely moving the wings, its legs extended in a straight line behind, and its remarkable length and curvature of wing distinguishing it from all similar birds. The height at which it thus gracefully glides varies from one to two hundred feet, while it reconnoitres carefully the face of the deep beneath. Suddenly it is seen to check its course, as if struck by a particular object, which it seems to survey, for a few moments, so steadily, that it appears as if fixed in the air, and flapping its wings. But the fish on which it was intent has disappeared, and again the osprey is seen sailing around as before. Again its attention is arrested, and a descent is made with great rapidity; but, ere it reaches the surface, it shoots off on another course, as if ashamed that a second victim has escaped. It now sails at a short height above the surface, and, by a zigzag descent, and without seeming to dip its feet in the water, seizes a fish, which it always carries head foremost, and, having ascended a few feet, shakes itself, like a water spaniel, and directs its heavy and laborious course directly for the land. If the wind blow hard, and the nest lie in the quarter from whence it comes, with great judgment and exertion it beats to windward, not in a direct line—that is, "in the wind's eye"—but making several successive tacks, to gain its purpose. This will appear the more striking when the size of the fish sometimes borne along is considered. A shad, for instance, was taken from a fish-hawk, which, though it had already ate a considerable portion of it, weighed six pounds ; nor is this a solitary case. It is singular that this bird never descends to pick up a fish it has dropped, either on the land or in the water. In its fishing pursuits, however, it sometimes mistakes its mark, or overrates its strength, by striking fish too large and powerful for it to manage : thus, it is dragged under the water, and, though it may succeed in extricating itself, after being taken three or four times down, yet often both fish and fish-hawk perish. The bodies of sturgeon and other large fish, with that of an osprey fast grappled in them, have, at different times, been found dead on the shore, cast up by the waves.

THE OSPREY.

The male assists in incubation, one supplying the other with food, though each, in its turn, going in quest of some for itself. At such times the male is sometimes observed rising to a great height in the air, over the nest where its mate is seated, and occasionally uttering a cackling kind of note, by which the observer can track it in its course. On attaining its utmost elevation, when the eye can no longer perceive it, it utters a loud shriek, and dives smoothly, on half-extended wings, towards its nest. But soon it is seen to expand its wings and tail, and to glide towards its mate in a beautifully-curved line ; when she partially raises herself from her eggs, utters a low cry, resumes her former posture, and her delighted partner flies off to the sea, to seek a favourite fish for her.

THE SECRETARY BIRD.

This bird resembles, in some degree, the eagle and the crane, having its head shaped like that of the former, and its body somewhat like the body of the latter. Several long dark-coloured feathers spring from the back of the head and hang loosely behind, like a pendent crest, and can be erected or depressed at pleasure. Le Vaillant says:—"The Dutch gave it the name of Secretary, on account of the bunch of quills behind its head; for, in Holland, clerks, when interrupted in their writing, stick their pen in their hair, behind the right ear; and to this the tuft of the bird was thought to bear a resemblance."

THE HARPY EAGLE.

The Hottentots, at the Cape of Good Hope, called this bird *Slang-vraters*, or Serpent-eater, and in the destruction of these reptiles, which abound in its native country, it is very serviceable.

On approaching them, it is always careful to carry the point of one of its wings forward, to parry their venomous bites. Sometimes it spurns and treads upon its antagonist, or else, taking the serpent upon its pinions, throws it into the air. When it has, at length, wearied its adversary, or rendered it almost senseless, the bird kills and swallows the reptile at leisure without danger.

An obstinate battle, conducted with equal address on both sides, was witnessed by M. Le Vaillant. At length, the serpent, feeling the inferiority of its strength, tried, most cunningly, to regain its hole, when the bird, apparently guessing its design, placed itself before the reptile at a single leap, and so cut off its retreat. Again and again it was thus intercepted, when, as if to intimidate the bird, it erected itself boldly, and, hissing dreadfully, displayed its menacing throat, inflamed eyes, and a head swollen with rage and venom. Sometimes this threatening appearance produced a momentary cessation of hostilities; but the bird soon returned to the charge, and, covering its body with one of its wings as a buckler, struck its enemy with the bony protuberance of the other. Le Vaillant saw the serpent at last stagger and fall; the conqueror then fell upon it to inflict the *coup-de-grace*, and, with one stroke of the beak, laid open the skull.

At this instant, Vaillant fired at and killed the bird. On dissecting it, he found in its craw eleven tolerably large lizards; three serpents, each as long as his arm; eleven small tortoises, most of which were about two inches in diameter; and a number of locusts and other insects, several of them sufficiently whole to be worth preserving and adding to his collection. He observed, too, that, in addition to this mass of food, the craw contained a sort of ball, as large as the egg of a goose, formed of the vertebræ of serpents and lizards, shells of different tortoises, and wings, claws, and shields of different kinds of beetles. This indigestible mass, when sufficiently large, would doubtless have been disgorged, in the manner of other rapacious birds.

The Secretary Bird makes a flat nest with twigs, full three feet in diameter, and lined with wool and feathers. This is usually formed in some high tuft of trees, and is often so well concealed as not readily to be discovered.

This bird is easily tamed, and, when domesticated, will eat any kind of food, either dressed or raw. Le Vaillant saw many in this state in the plantations of the Cape. He says, they commonly lay two or three white eggs, nearly as large as those of a goose. The young remain a great while in the nest; because, from their legs being long and slender, they cannot easily support themselves. Even at the age of four months, they may be seen to walk resting on the heel, which gives them an awkward appearance. Thunberg says they are very apt to break their legs. When, however, they are seven months' old, and have attained their full size, they display much ease, and even grace, in their motions, which well accord with the stately figure of the bird. It is very remarkable, that, in all their contests, these birds strike forwards with their legs, and not backwards, like others.

THE HARPY EAGLE.*

The length of this bird, from beak to tail, is three feet and a half, and even more. The head is covered with a thick, soft, downy plumage, of a light, slaty-gray. Its upper mandible is remarkably thick at the base, from whence it is continued for some distance in a straight line, but suddenly curves downward with a strong arch towards the point, which is extremely sharp: the lower mandible is straight, short, and obtuse.

From the back part of the head arises a crest composed of numerous broad feathers, increasing in length towards the middle of the head, and thus assuming a rounded form, of a dull black, with the exception of a slight margin of gray on the tips of the longer feathers, and a more extensive tinge of the same colour on those of the sides. This crest is slightly raised above the level of the feathers of the back of the neck, when the bird is quiet, but is capable of being raised at right angles with them on any sudden excitement. Below the crest, the whole of the back and wings, together with a broad collar encircling the fore part of the neck, is black, without gloss or reflection, each of the feathers of the back terminating in a narrow, transverse, and somewhat lighter, streak. The under surface, from the breast backwards, is pure white; and the plumage of the legs is marked, on the same ground, with transverse blackish bars.

The tail is crossed by four transverse black bands, of about equal breadth, with the four alternating whitish or ash-coloured spaces; its tip is of a light-ash colour. The wings do not reach, when closed, beyond the middle of the tail, which is rounded at the extremity. The legs are only partially feathered on the upper part of their anterior surface, the remaining portion being naked and reticulated; and the talons are excessively powerful. The beak and claws are black, and the legs dull yellow.

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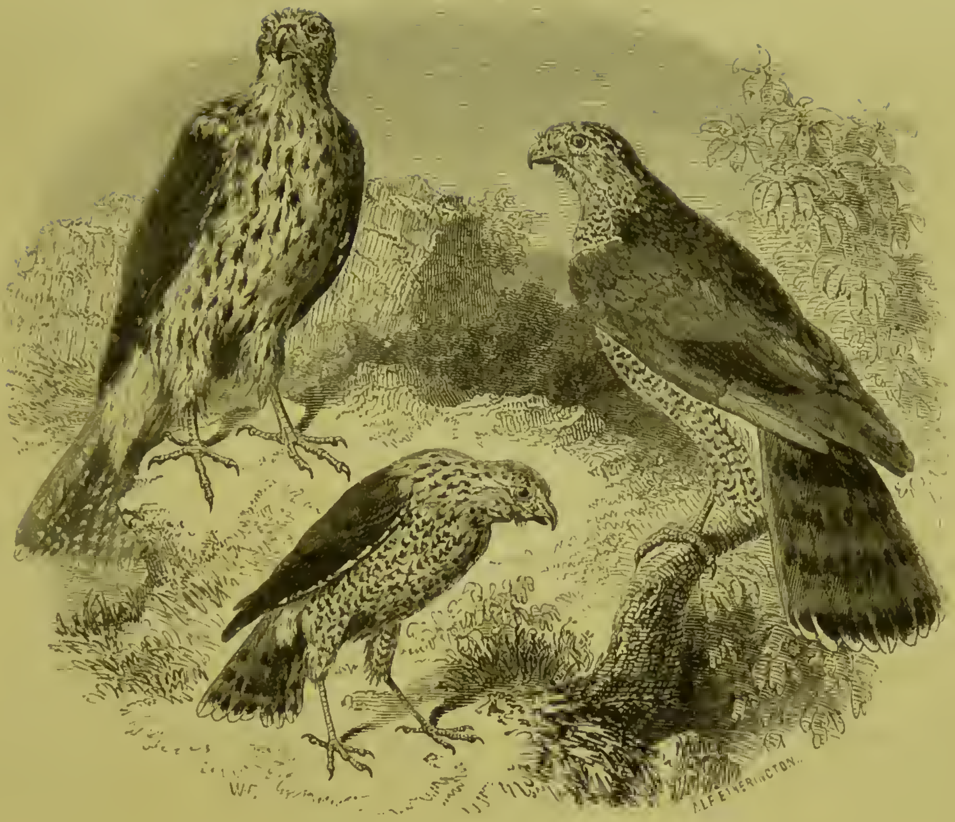
* Harpyia Destructor.



THE FALCONS.

Falconry appears to have been first introduced into England from the north of Europe. Our Saxon ancestors became passionately fond of the sport, but do not appear to have made much progress in the training of the birds. After the conquest of our island by William, none but persons of the highest rank were allowed to keep hawks—the general name by which all such birds were distinguished. The mass of the people were then serfs or slaves, and the life of one of them was of less value, in the eyes of a Norman baron, than that of a hawk, a hound, or a buck. But, in the time of King John, every freeman was permitted to have eyries of these rapacious birds in his own woods.

The value attached to them, as well as their aptness to fly away, is evident from a law of Edward III. According to this, any person finding one of the species was to carry it immediately to the sheriff of the county, who was to cause a proclamation of it to be made in all the principal towns, and the owner of the lost bird, if discovered, was to receive it back from the sheriff, on paying the cost incurred for its maintenance. If not claimed in four months, the hawk was to become the property of the finder, if the person who found it were of proper rank; but if he were not, the hawk was to be claimed by the sheriff, who, however, was to give the poor man something for his trouble. Any attempt of the finder to secrete or appropriate it was, like the stealing a hawk, to be punished as felony. One of the bishops, in the reign of Edward III., excommunicated certain persons for stealing a hawk that was sitting on her perch in the cloisters of Bermondsey, in Southwark. The guilt of sacrilege, it was contended, was added, in this instance, to that of theft, for the bird was purloined during the performance of divine service in the choir; but, probably, the ecclesiastic's choler was aroused from the fact of the hawk being his own.

The following complaint was made by a writer of the fifteenth century:—

"Into the church then comes another sotte,
Withouten devotion, setting up and down,
Or to be seene, and showe his garded cote;
Another on his fiste a sparhawke or fawcone,
Or else a cokow; wasting so his shone."

That the clergy were fond of pastimes is evident from the satires of our old poet, Chaucer, who represents a monk as more skilled in riding and hunting than in divinity; and taxes such persons generally with worldly pride, because they rode high-bred horses, like knights, having their hawks and hounds with them. In France and Italy they were no less addicted to the sports of the field; and hence Ricordans Malespina, a Florentine, speaks of a churchman hunting and hawking "like a layman."

All over Europe hawks were long considered as restricted to the higher ranks. A knight seldom stirred from his house without his falcon on his wrist, and his hound at his heels: in this way, such persons are represented in their portraits; while those who did not die on the field of battle are still seen, in their sculptured monuments, with a falcon on hand and a dog at their feet.

The Falcon Family were alone employed in the sports that prevailed, and two or three species were used in preference to others. Of those possessing long wings, the falcon proper and the ger-falcon, and of the short-winged, the goshawk and the sparrow-hawk, were in special request; and, next to these, the hobby, the kestrel, the merlin, and the buzzard, were preferred. The female, which, in all the varieties of this tribe, is considerably larger than the male, was alone employed in sport, and the common names of all the species apply to that sex, the male having usually some distinctive appellation. Thus, the male of the ger-falcon was called the *Jerkin;* of the falcon proper, the *Tierce Gentle;* of the goshawk, the *Tiercel;* and of the sparrow-hawk, the *Musket.* The word *gentle,* moreover, so often used, has no reference to the disposition of the bird, but to its being reclaimed and duly trained for falconry.

The attire of one of these birds, which was used from the first, is worthy of notice. A leathern *hood,* surmounted with gay feathers, was worn on the head, to shut up the eyes; straps, called *jesses,* were fitted to the legs; a small silver *bell* was attached to each of them; and the *leash,* a long slender strap, sometimes lengthened by a *creance,* or common cord, was used as a tether, while it made a considerable allowance for free motion. The bird was first *manned*—that is, used to the presence of human beings. When it did right, it was fed; when otherwise, it was left hungry; and, when very refractory, a stream of water was directed at its head. One object was, to teach the bird to fly at its proper game, and another, to bring it back to its master's hand. The first was sought, in the case of long-winged birds, by a *lure,* consisting of a stick or cord, at the end of which were pieces of flesh, with a bunch of feathers, or an actual resemblance of the intended prey. A falcon being set loose by one man, another, standing at a distance, waved the lure round his head, and thus tempted the bird to advance and strike at it. A *whistle* was used to bring back the hawk, which, when kept on the hand, required very strong gloves, as a defence from its talons.

Izaak Walton says:—"In the air, my noble, generous falcon, ascends to such a height as the dull eyes of beasts and fish are not able to reach to—their bodies are too gross for such high elevation—but from which height I can make her descend by a word from my mouth, which she both knows and obeys; to accept of meat from my hand; to own me for her master; to go home with me; and be willing the next day to afford me like recreation."

Edmund Bert, in his "Treatise of Hawks and Hawking," says:—"I have heard of some who watched and kept their hawks awake seven nights and as many days, and yet they would be wild, rammish, and disorderly." His own experience must have been considerable, for he reared these birds himself, and boasted that he had sold a simple goshawk and tercel of his training for one hundred marks. Indeed, nearly all his time, except when he slept, must have been occupied by his birds; and wisely he seems to have thought, for he naively remarks:—"I feel it most burdensome to spend my time *idly.*" In the reign of James I., Sir Thomas Monson is said to have given £1,000 for a cast of hawks: a *cast* denoting two, as a *lese* did three.

The sports of those times, as of later date, were not without their difficulties and perils. Old Hall relates, indeed, that Henry VIII., on one occasion, nearly lost his life when engaged in hawking. It was the custom, not only to cast off the falcon and follow it on horseback, but also, where the ground was broken, covered with wood, or intersected by marshes or water, to pursue the pastime on foot; in the latter case, each sportsman carried a long pole, to aid him in jumping over rivulets and ditches. Vaulting over a ditch at Hitchin, in Hertfordshire, Henry's pole broke, and he fell head downward into the deep mud, which almost smothered him; and there he would have died, but for one John Moody, a serving-man, who, happening to be near, leaped into the ditch, and rescued the king. "And so," says the chronicler, "God in his goodnesse preserved hym."

Of falconry there are many traces in our choicest literature. Boccacio, in one of his most touching stories, relates that a reduced gentleman long wooed a lady unsuccessfully, but, at length, on her visiting him, having no other means of entertaining her, sacrificed his falcon for her meal, and thereby, though without design, gained her affections. Dante and Spenser, as well as Chaucer, allude to this royal, princely, and noble pastime. Shakespeare, thinking of setting off the hawk on her flights, makes Othello exclaim, respecting the suspected Desdemona—

"I'll whistle her off, and let her down the wind,
To prey at fortune;"

as the poet, dwelling on the bird descending on its prey, puts the frantic question into the lips of Macduff—

"What! all my pretty ones, all?"

Not less clearly are many of our words to be traced to falconry. George Turbervile, in his "Booke of Falconrie or Hawking," has a chapter "of accidents that happen and light uppon a hawkes feathers, and first how to use the matter when a feather cannot be ymped." And then he proceeds to tell "the way and manner how to ympe a hawkes feather, howsoever it be broken or bruised;" and four modes of operating, according to circumstances, are described. And, singularly enough, Milton speaks of "*imping* his wing for a bolder flight." In like manner, Sir Philip Sidney says, in praise of Edward IV.—

"Not for his fair outside, nor well-filled brain,
Although less gifts *imp* feathers oft on Fame."

As hawks were kept hooded till they were ready to fly, we have the word *hood-wink*, meaning to blind by covering the eyes. Thus, Shakespeare says—

"We will blind and *hood-wink* him,"

And again—

"For the prize I'll bring thee to,
Shall *hood-wink* this mischance,"

The *lure* has also become an image of any enticement, as that of beauty or gain. Bacon speaks of "standing by one that *lured* loud and shrill;" Temple, of being "*lured* on by the pleasures of the bait;" while Gay says—

"And various science *lures* the learned eye."

The term *hawker* is traced by some to the persons who reared these birds, and carried them about for sale. But of the origin of the word *mews* there can be no doubt. In falconers' language, it meant strictly a place where hawks *mewed*—from *mew*, or shedding of feathers, which occurred at their moulting season. Henry VIII. removed the royal hawks from the mews at Charing Cross, where they had been kept during many reigns, and converted that place into stables. The name, however, confirmed by usage during so long a period, remained to the building, close to, if not on the very site of, the National Gallery, as will be remembered by many of the fathers of the present generation, which continued to be called the "King's Mews," thoughlong since Henry VIII. had so changed its distinction as to render the name wholly inapplicable. Nor is another fact less remarkable, when, in times after those of that monarch, the people of London began to build ranges of stabling at the back of their streets and houses, they called those places "mews," after the old stabling at Charing Cross, which, as we have shown, was mis-named from the time that the royal hawks ceased to find there a domicile.

Some of the sayings of country people have, doubtless, originated in the practice of falconry. Thus, a stupid fellow has often been described as one "that can't tell a hawk from a handsaw." Here the word "hawk" leads us at once back to the practice; but this is done still more fully by the other word, which should be "hernsaw," or "hernshaw;" these being, for ages, popular names of the heron, very frequently the game of the falcon, and so used by Spenser and other English writers. The proverb is as old as the time of Shakespeare, who puts it into the mouth of Hamlet. John Shaw, in his curious book, "Speculum Mundi"—The World's Looking Glass—informs us that "the heron, or hernsaw, is a large fowle that liveth about waters," and that hath a marvellous hatred to the hawk, which hatred is duly returned. "When they fight above in the air," he says, "they labour both especially for this one thing, that one may ascend and be above the other. Now, if the hawk getteth the upper place, he overthroweth and vanquisheth the heron with a marvellous earnest flight." The contrary, however, was sometimes the case, for the heron received the hawk on its long, sharp bill, and so transfixed and killed her.

FOOT OF THE FALCON.

James I., in his book of advice to his eldest son, Henry, Prince of Wales, after commending certain manly exercises, thus wrote:—"As for hawking, I condemn it not, but I must praise it more sparingly, because it neither resembleth the warres so near as hunting doeth, in making a man hardie and skilfully ridden in all grounds, and is more uncertain and subject to mischances; and, which is worst of all, is there through an extreme stirrer-up of the passions." Such passions, however, it has long ceased to stir in our country. The invention of gunpowder, and the gradual improvement of the heavy matchlock into the fowling-pieces of Manton and Richards, have been fatal to hawking as a frequent sport; while books and pictures, intellectual employments and amusements of various kinds, offer their advantages to the many, instead of being restricted, like falconry in former times, to the practice of the few.

The greatest falconer of modern times was one of the Lord Orfords, who died towards the close of the last century. He is said to have incurred an expense of £100 per annum for every hawk he kept, for it had its separate attendant, and was sent, like its fellows, on occasional voyages to the continent, for the preservation of its plumage and courage. The Grand Falconer was one of the most illustrious officers of the royal courts of Europe, from whom we, probably, borrowed the idea, and with us the distinction became hereditary. In the year 1828, the Duke of St. Albans, the hereditary Grand Falconer of England, gave a display of this practice at Redbourne, near St. Albans. The birds, eight fine falcons, were each chained to a section of a cone of wood, about fifteen inches in height, and ten inches in diameter at the base. They were unhooded, but belled, and mostly sat at the top of their posts.

THE FALCON.

Six of them were taken for the sport of the day. A dog having pointed, a hawk was unhooded and loosed; it rose, wheeling over the heads of the party, sweeping to the right and left; now ascending into the mid-air in the distance, and now obeying the hawker's call. The partridge was flushed, and flew with the wind towards the company, when the hawk suddenly crossed its line of flight, and, seizing it at a height of thirty or forty yards, bore it in his beak, screaming and bleeding, over the heads of the company, conveying it down to the belt of an adjoining plantation. The falcon was recovered. Other flights, which it is needless to describe, were not so successful, and some of the falcons flew off, and could not be recovered to the hand of the falconer. We now meet with hawking occasionally, as varying the sports which are still kept up in our country.

THE ICELAND FALCON.*

Bred in the crags of the Polar rocks, this fine bird is well prepared for the fitful and furious blasts which occasionally rage in countries near the ice; and, though its neighbouring prey might seem to be scanty, yet for this it is amply compensated, as it surpasses all the falcons in its command of the air.

Though the distance from Iceland to those parts of Scotland and the isles where it is seen is about five hundred miles, this is said to be merely a morning's journey for this falcon, from which it can easily return the same evening. When in mature plumage, it is white, with bars and barb-shaped dashes of brown, which become less and less with age, though they are seldom or never lost. It is found only in the wilds, and, therefore, its habits, in a state of nature, are much less known than those of many of the tribe.

Its names are numerous, for, in different stages of its plumage, it has been taken for as many species. It has often been called the Ger-Falcon, and yet there is said to be a difference in flight, and in the mode of making the stoop, between this bird and the Iceland Falcon. It is also stated that the ger-falcon is commonly obtained in Norway, where the true Iceland falcon is never met with; that the measurements of the tail and wings differ; that they require different modes of training; and that the Iceland bird is more intractable than the ger-falcon of Norway, but of higher courage, and of more bold and rapid flight.

Sir John Richardson states that it is a constant resident in the Hudson's Bay territories, and mentions the following incident:—

"In the middle of June, a pair of these birds attacked me as I was climbing in the vicinity of their nest, which was built on a lofty precipice on the borders of Point Lake, in latitude 65½°. They flew in circles, uttering loud and harsh screams, and alternately stooping with such velocity that their motion through the air produced a loud, rushing noise; they struck their claws within an inch or two of my head. I endeavoured, by keeping the barrel of my gun close to my cheek, and suddenly elevating its muzzle when they were in the act of striking, to ascertain whether they had the power of instantaneously changing the direction of their rapid course, and found that they invariably rose above the obstacle with the quickness of thought, showing equal acuteness of vision and power of motion. Although their flight was much more rapid, they bore considerable resemblance to the snowy owl."

THE ICELAND FALCON.

THE PEREGRINE FALCON.†

It is only to look at a male bird of this species, when in full plumage, to see, in its compact muscularity of form, and in its openness and boldness of expression, an example of perfect adaptation to swiftness of wing and a life of rapine.

The Peregrine is only met with as a straggler in the rich lowlands of England, but in the mountainous regions of the north, in the border counties, and in many parts of Wales, its eyries are still said to be found. On entering the Scottish frontier, it is still more common; it becomes rarer in the lower and richer valley of the Forth or Mid-Lothian, but on rising to the Highland ranges it again prevails. In Ireland, it occurs in all suitable localities. Though it appears in America, it is of more rare occurrence than the hawks, which delight in wooded tracts, and is scarce, therefore, in the wooded parts of the fir countries. It is migratory in Louisiana, and seldom occurs in the middle and southern States, while, in some parts of America, Audubon thinks these birds may breed; and the Falls of Niagara, mentioned as one station, would quite accord with the habits of the Peregrine Falcon. It seems, also, to have been observed in Africa, and it is supposed to occur in the Alpine regions of India.

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* Falco Icelandicus.

† Falco peregrinus.

The nest, composed of a considerable mass of sticks and coarse stems of grasses or ferns, is usually placed on the face of some precipitous cliff, resting on a shelve of the rock, on the tuft of vegetation, or in a horizontal cleft. But an eyrie has been observed, placed in such a cleft, while the eggs were laid on the bare surface, among the refuse of plane-roots, the spot being rendered slightly hollow by a little working with the breast of the bird.

THE PEREGRINE FALCON.

The variations of plumage which occur in the different ages of the peregrine has greatly confused descriptions of this species. In the first year it is generally of a light brown on the upper parts, with an ash-coloured tinge on the middle of the feathers; its head and neck are whitish, tinged with red, and numerous dark-brown spots; its throat and under parts are dirty white, with longitudinal spots of brown; its cere is of a bluish horn-colour, and its legs are yellow. It is only at the third or fourth moulting that the peregrine assumes any settled character; and, even after that time, the bird gradually becomes lighter as it advances in age.

The peregrine falcon has a peculiarity of character which is not very distinct in the young male, and is more faintly marked in the female. It consists of a broad black streak passing downward obliquely over the cheeks from the inner angle of each eye, and giving to the bird a very singular expression of countenance. When full grown, the beak is lead-coloured, with a darker tip; the cere has a greenish tinge; the irides are yellow; the upper parts of the head and neck are of a blueish-black; the back has a lighter tinge of lead-colour, crossed by scarcely perceptible blackish bars; and the black whiskers are strongly developed. The quill-feathers of the wings and tail are of a dusky black—the latter being crossed by numerous ash-coloured bars, and yellowish-white at the tip; all the under parts are white; a series of transverse brownish bars begin on the lower part of the breast and extend to the tail; the upper part of the breast is marked by a few longitudinal streaks, but the throat is entirely free.

The flight of the peregrine is amazingly rapid. Unless disappointed in its chase of prey, it is rarely seen sailing; and even then it rises with a broad, spiral circuit, to a sufficient height to reconnoitre a certain space below. Its search is often made with a flight resembling that of a tame pigeon, until, catching sight of an object, it redoubles its flappings, and nears the timorous quarry at every turn and back-cutting which it attempts. Arriving within a few feet of it, the peregrine protrudes its powerful legs and talons to their full stretch. Its wings are, for a moment, almost closed; the next, it seizes the prize, which, if too weighty to be instantly carried off, it forces obliquely towards the ground, sometimes a hundred yards from where it was captured, to kill or devour it on the spot.

"The peregrine," says Sir John Sebright, "seems often to strike down birds for his amusement; and I have seen one knock down and kill two rooks, who were unlucky enough to cross his flight, without taking the trouble to look at them after they fell. In the plain country, near the sea-shore, the peregrine frequently pursues the peewits and other birds that frequent the coast. The golden plover, too, is a favourite prey, and affords the hawk a severe chase before he is caught. I have seen a pursuit of this kind last for nearly ten minutes, the plover turning and doubling, like a hare before greyhounds, at one moment darting like an arrow into the air, high above the falcon's head; at the next, sweeping round some bush or headland, but in vain. The hawk, with steady, relentless flight, without seeming to hurry herself, never gives up the chase till the poor plover, seemingly quite exhausted, slackens her pace, and is caught by the hawk's talons in mid-air and carried off to a convenient hillock, or stone, to be quietly devoured."

MERLINS.

THE MERLIN.[*]

This beautiful bird is not so tall as the peregrine; but, though smaller, its form is perfect in symmetry, and its colours, though distributed somewhat similarly, are more brilliant and better marked. Nor does it, like that falcon, often rise above its prey, and then rush down; but it instantly gives chase closely following the victim through all its turns and windings, and is generally successful, unless cover

[*] *Falco æsalon*: Willoughby.

is at hand. When passing from one part of an inclosed country to another, it flies with arrow-like rapidity.

The Merlin is found in various parts of the United Kingdom, and also in America. Its nest is generally placed on a projecting rock, bank, or tuft of heath, and is usually very accessible. It is composed of a few sticks or stalks of heather, loosely and coarsely laid together, and has no lining. The eggs are from three to five in number, of a dark reddish-brown, with darker spots and blotches—the colour, form, and markings, with the variations of the different specimens, resembling those of the peregrine. The female is easily approached at first; but, if disturbed more than once, or fired at, it becomes extremely shy. Her mate is generally near at hand, perched on some rising ground or rocky height, and gives notice of the approach of any intruder by very shrill cries and rapid flight around.

"The merlin," says Mr. Lloyd, "is a very bold bird, and seems afraid of nothing. I one day winged one as he was passing over my head at a great height. The little fellow, small as he was, flung himself on his back when I went to pick him up, and gave battle most furiously, darting out his talons (which were as hard and sharp as needles) at everything that approached him. We took him home, however, and I put him into the walled garden, where he lived for more than a year. He very soon became quite tame, and came on being called to receive his food, which consisted of birds, mice, &c. So fearless was he, that he flew instantly at the largest kind of sea-gull or crow that we gave him. When hungry, and no other food was at hand, he would attend the gardener when digging, and swallow the large earth-worms when turned up. To my great regret, we found the little bird lying dead under the tree in which he usually roosted; and, though I examined him carefully, I could not find out the cause of his death.

THE HOBBY.

"Although all these small hawks which frequent this country destroy a certain quantity of game, their principal food consists of thrushes, blackbirds, and other small birds. In the winter, when the greenfinches collect in large flocks on the stubble fields, I have frequently seen the merlin, or sparrow-hawk, suddenly glide round the angle of some hedge-row or plantation, and, taking up a bird from the middle of the flock, carry it off almost before his presence is observed by the rest of the greenfinches."

THE HOBBY.*

This finely-formed falcon, with wings longer than those of the peregrine, and of great power, occurs chiefly in the richer and more inclosed districts of our country, and evidently delights in woods, from whence it can sally forth to prey in an open tract. It breeds on trees, sometimes among the forsaken nests of the crow or magpie; the eggs are said to be of a blueish-white, with blotches of yellow or olive-green.

Montague and Selby have witnessed the Hobby's chase of the lark, and, like other naturalists, have noticed its strong predilection for this prey. It is a very active bird; was formerly trained to "hawk;" quails and larks were its principal game, but partridges were sometimes attempted. The hobby is common in France, Germany, and other countries of Europe, and has been met with even in the deserts of Tartary and Siberia.

THE KESTREL.†

This is a common bird in many parts of Europe. Its colour is red, spotted with black above; underneath it is white, spotted with pale brown; the head and tail of the male are ashy. It frequents the open country, woods, and old barns. It destroys a great number of small birds; it frequently darts on partridges and field-mice, while common mice, frogs, and even insects, are often seized as its food.

The female is bolder and less wild than the male, and will enter gardens and come close to habitations. The nest consists of twigs and roots intermingled; sometimes these birds will content themselves with the old nests of crows. The female lays five or six eggs, of a ferruginous colour, pale, but marked with deeper spots, irregularly distributed, and of different forms and sizes. The young are, at first, fed with insects, and afterwards with flesh, brought also by their parents.

The Kestrels hover at great heights, describe a circle, and sustain themselves in the air for a long time, by beating the air with their wings, in an almost insensible motion. They repeat frequently, and with a sharp sound, a cry resembling the syllables, *pri, pri, pri.* On catching sight of prey, they dart on it with the greatest directness and rapidity; but, should the first attack fail, they pursue it with extreme velocity and the utmost perseverance.

THE GOSHAWK.‡

The colour of the plumage of this bird, in its maturity, is hair-brown, of different shades, generally darker on the crown, and with the base of the feathers on the back of the neck having so much white as to be seen in almost any position, and to give this part a spotted appearance. The quills are darker towards the tips, and are barred on the inner webs with a still deeper shade; the tail is barred with liver-brown, and is tipped with white; the terminal band is broadest, the others decreasing gradually in their depth of shade upwards; the base of the inner webs is nearly white, clouded with hair-brown; a streak over the eye, cheeks, and lower parts, white; on the eye, cheeks, throat, and sides of the neck, it is streaked along the centre of the feathers with clove-brown; on the throat, belly, and flanks, it is broadly barred with the same colour, the shafts of each feather being of the same tint; the plumes of the lower extremities have the bars narrower and of a paler tint; the under-tail coverts are of pure white; the tarsi and toes are yellow; the claws black, sharp, and pointed.

The Goshawk prefers for its dwelling-place the wooded dells of the mountains, or the wild cliffs of the sea-shore; for there it can nestle undisturbed, and easily reach the spots which abound with birds and small quadrupeds, its usual prey. It flies, however, as civilization advances, and hence is seldom seen in the lowlands of Scotland, and still more rarely in England.

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* Falco subbuteo: Ray.

† Falco tinnunculus: Gould.

‡ Falco palumbarius.

Where it abounds, it is very destructive to mountain game, as it kills the old birds, and the broods perish. Its eggs seldom exceed four. So docile is it that it has been called, in past times, the "Falcon Gentle."

THE GOSHAWK.

A bird of this kind is found in Syria, of an extraordinarily courageous and even fierce disposition. Dr. Russell says, when describing Aleppo:—"Were there not several gentlemen now in England to bear witness to the fact, I should hardly venture to assert that, with this bird, which is about the size of a pigeon, the inhabitants sometimes take large eagles. The hawk, in former times, was taught to seize the eagle under the pinion, and thus, depriving him of the use of one wing, both birds fell to the ground together; but I am informed that the present mode is to teach the hawk to fix on the back, between the wings, which has the same effect, only that, the bird tumbling down more slowly, the falconer has more time to come to his hawk's assistance; but, in either case, if he be not very expeditious, the falcon is inevitably destroyed.

"I never saw the shaheen fly at eagles, that sport being disused in my time; but I have often seen him take herons and storks. The hawk, when thrown off, flies for some time in a horizontal line, not six feet from the ground, then, mounting perpendicularly with astonishing swiftness, he seizes his prey under the wing, and both together come tumbling to the ground. If the falconer, however, is not very expeditious, the prey soon disengages itself."

THE SPARROW-HAWK.*

Next to the kestrel, this is the most abundant of the British birds of prey. It chooses extensive woods for its retreat, for there it can make excursions, and return, at pleasure, to its roosting-place or its nest. With a form adapted to pass rapidly among the trunks of trees and in thickets, and with its ample and rudder-like tail, it has a gliding flight in the open country, skimming at a short distance from the ground, along the back of hedges or the skirts of some cover, while it passes easily and exactly, with a bound, any obstacle that appears in its way. With the same rapidity and ease the prey is seized, and the stoop to the ground is made, and the capture effected so instantaneously as almost to elude the eye.

The male Sparrow-Hawk preys on smaller birds, his weight not allowing him to carry off a heavy quarry; but his more powerful mate can easily kill a partridge or a pigeon. Except in peculiar districts, a wood is chosen as a breeding-place; the nest is composed of sticks and twigs, loosely put together on a straggling base; and there are from three to five eggs, of a bluish-white, with large brown blotches. When incubation begins, the female is shy, but after a time will allow a near approach; but the male does not watch, like the tree falcons, much less does he trouble himself to imitate their violent perturbations and vehement screams.

Mr. Ross Cox, in his "Adventures on the Colombia River," describes one that may here be given. He and his party stopped, one very sultry day, about noon, to rest their horses and enjoy the cooling shade afforded by a clump of sycamore trees, with a refreshing draught from a neighbouring spring.

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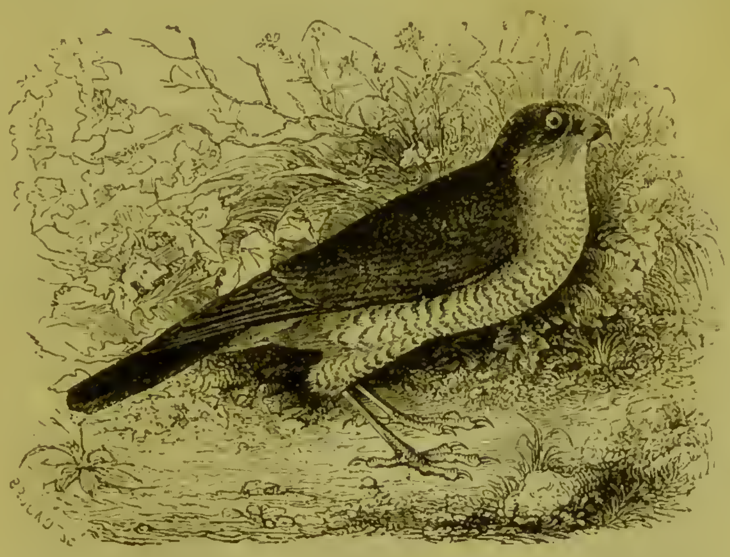
* *Accipiter fringillarius*: Willoughby.

THE AMERICAN SPARROW-HAWK.

Several large hawks were flying about the spot, two of which were brought down; and, from their great size, huge claws, and large hooked beaks, it was clear they could easily have carried off a common-sized duck or goose.

Close to the resting-place was a low hill, round the top of which Mr. Cox saw the hawks assemble; and, judging that a nest was there, he determined, by himself, to find it out. He, therefore, cautiously ascended the eminence, on the summit of which he perceived a nest, larger than a common-sized market-basket, formed of branches of trees—one being laid regularly over the other, and the least of them being an inch in circumference. Around it were scattered skeletons, bones, and half-mangled bodies of pigeons, sparrows, humming and other birds. Next to a rattle-snake and a shark, his greatest aversion is to a hawk, and this was not diminished by observing the remains of the feathered tribes, which had, from time to time, been greedily devoured. "I therefore determined," he says, "to destroy the nest and disperse its inhabitants; but I had scarcely commenced the work of demolition with my dagger, when old and young flew out and attacked me in every direction, but particularly about my face and eyes—the latter of which, as a punishment for my temerity, they seemed determined to separate from their sockets. In the meantime, I roared out lustily for assistance, and laid about me with the dagger. Three men promptly ran up the hill, and called out to me to shut my eyes and throw myself on the ground, otherwise I should be shortly blinded, promising, in the meantime, to assist me. I obeyed their directions; and, just as I began to kiss the earth, a bullet from one of their rifles brought down a large hawk, apparently the father of the gang. He fell close to my neck, and, in his expiring agonies, made a desperate bite at my left ear, which I escaped, and in return gave him the *coup-de-grace*, by thrusting about four inches of my dagger down his throat. The death of their chieftain was followed by that of two others, which completely dispersed them, and we retired after breaking up their den."



THE SPARROW-HAWK.

THE COMMON KITE.*

A PECULIAR and graceful mode of flight distinguishes this bird from every British hawk: hence its provincial name of *gled*, or *glede*, from a Saxon verb, whence our modern word to *glide*, from its gliding along on pinions outspread, but motionless. The Kite is common, not only in England but in most parts of Europe, and the neighbouring districts of Africa.

The male and female differ little in colour or size. The entire upper surface is of a reddish-brown, each feather being edged with a lighter tint. The feathers of the head and neck are long and pointed, of a dull grayish-white, with longitudinal streaks of dusky-brown; the under surface is rust colour, inclining to yellow, with longitudinal dusky spots; the tail is twelve inches long, and much forked;

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* Milvus ictinus.

it is of a bright reddish-brown, with obscure dusky bands. The feathers of the thighs are long and loose, and the toes of a bright yellow.

The kite prefers open downs and hilly districts, skirted with woods. Its nest, built in the forked branches of a tall tree, is made of sticks and twigs, and lined with wool, rags, or other soft materials; and can only be found in some secluded place. There are three eggs, of a blueish-white, with a few brown blotches.

No sooner do the poultry of a farm-yard perceive a kite, than they set up a general scream. Should, however, the farmer be aroused in defence of his fowls and ducks, and bring forth his gun, the wary bird will wheel off, in widening circles, until out of danger. But, as soon as the coast is clear, after a few gyrations, down it sweeps, scattering confusion all around, and then bearing away one of the terrified broods, screaming in its claws. If once successful, it will repeat the visit, until the poultry are seriously thinned, or the gun of the farm-house has taken its revenge on the audacious and insatiable foe.

THE COMMON KITE.

Nor can a greater enemy be found to the young grouse; even black game and hares are carried by the kite to its nest. During the season when she has no young ones to provide for, carrion of all kinds forms her principal food. In consequence of her greed, however, the kite is very easily trapped. Following the course of streams, and hunting along the shores of a loch in search of dead fish, or any kind of drowned animals, one practice is, to peg down the entrails of some creature in the shallow part of the water, and then to place the trap, either on the adjoining shore, or to set it on a small artificial promontory close to the bait. As the bird soars at a great height, the garbage catches her eye, and the lure to her voracity proves fatal.

THE SWALLOW-TAILED KITE.*

This Kite, so like, in one respect, the bird with which we are so familiar—having a white body, and the wings and tail black—appears to be peculiar to the American Continent. Its habits and habitats are thus graphically portrayed by Audubon:—

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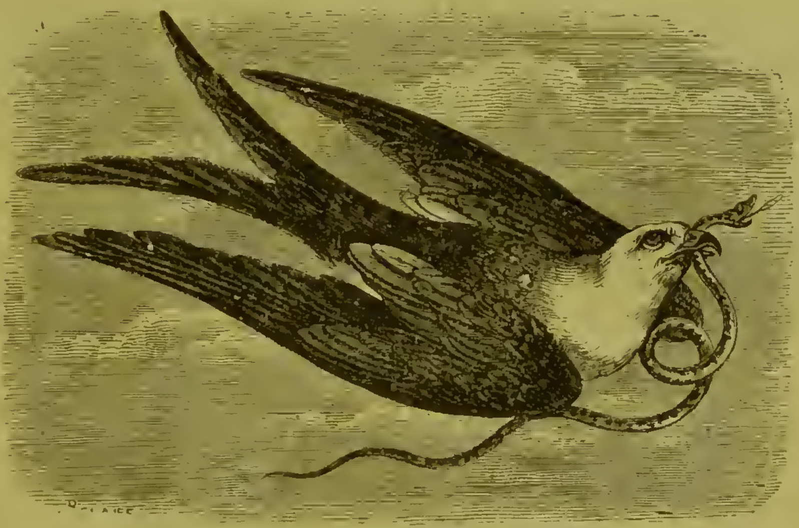
* Falco furcatus: Gmelin.

"A solitary individual of this species has once or twice been seen in Pennsylvania. Farther to the westward the swallow-tailed hawk has never, I believe, been observed. Travelling southward, along the Atlantic coast, we find it in Virginia, although in very small numbers. Beyond that state it becomes more abundant. Near the falls of the Ohio a pair had a nest, and reared four young ones, in 1820. In the lower parts of Kentucky it begins to become numerous; but in the states farther to the south, and particularly in parts near the sea, it is abundant. In the large prairies of the Attacapas and Oppellounsas it is extremely common.

"In the states of Louisiana and Mississippi, where these birds are abundant, they arrive in large companies in the beginning of April, and are heard uttering a sharp, plaintive note. At this period, I generally remarked that they came from the westward, and have counted upwards of a hundred, in the space of an hour, passing over me in a direct easterly course. At that season, and in the beginning of September, when they all return from the United States, they are easily approached when they have alighted, being then apparently fatigued, and busily engaged in preparing themselves for continuing their journey, by dressing and oiling their feathers. At all other times, however, it is extremely difficult to get near them, as they are generally on the wing through the day, and rest at night on the higher pines and cypresses bordering the river-bluffs, the lakes, or the swamps of that district of country.



THE SWALLOW-TAILED KITE.

"They always feed on the wing. In calm and warm weather, they soar to an immense height, pursuing the large insects called *musquito hawks,* and performing the most singular evolutions that can be conceived, using their tails with an elegance of motion peculiar to themselves. Their principal food, however, is large grasshoppers, green caterpillars, small snakes, lizards, and frogs. They sweep close over the fields, sometimes seeming to alight for a moment to secure a snake, and, holding it fast by the neck, they carry it off, and devour it in the air. When searching for grasshoppers and caterpillars, it is not difficult to approach them under cover of a fence or tree. When one of them is then and there killed, and falls to the ground, the whole flock comes over the dead bird, as if intent on carrying it off. An excellent opportunity is thus afforded of shooting as many as may be wanted; and I have killed several of these hawks in this manner, firing as fast as I could load my gun.

"The swallow-tailed hawk pairs immediately after its arrival in the southern states; and, as its courtships take place on the wing, its motions are then more beautiful than ever. The nest is usually placed on the top branches of the tallest oak or pine tree, situated on the margin of a stream or pond. It resembles that of a common crow extremely, being formed of dry sticks, intermixed with Spanish moss, and is lined with coarse grasses and a few feathers. The eggs are from four to six, of a greenish white colour, with a few irregular blotches of dark brown at the larger end. The male and the female sit alternately, the one feeding the other. The young are at first covered with a buff-coloured down; their next covering exhibits the pure white and black of the old birds, but without any of the glossy purplish tints of the latter. The tail, which, at first, is but slightly forked, becomes more so in a few weeks, and, at the approach of autumn, exhibits but little difference from that of the adult birds. The plumage is completed the first spring."

A bird of this kind was killed in Argyleshire in 1772, and another was captured alive in Yorkshire in 1805, but speedily escaped.

HEAD OF FALCO BIDENTATUS.

FOOT OF FALCO BIDENTATUS.

Another falcon* inhabits Brazil and Guiana. It is gray above, and brighter on the head and cheeks; beneath it is reddish, rayed with white; the throat and lower coverts are white; the bill is ash-gray; the feet and cere are yellow. Its length is fourteen inches.

The last to be noticed † is common from Egypt to the Cape; it is also found in America, India, and New Holland. Its plumage is soft, silky, and whitish, with the small curvature of the wings blackish.

Passing from the kites to the tribe of Buzzards, we find birds of considerable bodily power, but very inactive. Theirs is neither the bold deportment nor daring energy of the falcons or hawks of an equal, or even inferior size. Their spirit is not merely subdued, but timid. Instead of soaring aloft, sweeping down with resistless force on their prey, dashing at it obliquely with the greatest precision, or eagerly hunting for it as they sail over wide tracts of country, they sit patiently on their perch in the dense shade of the wood. There, however, they look out for the beetle on the wing, or the rat or the frog, the snake or the lizard, as it passes on the ground; and then, gliding towards it, on swift but steady pinions, they capture the victim, and bear it to their perch.

HEAD OF FALCO MENALOPTERUS.

FOOT OF FALCO MENALOPTERUS.

THE COMMON BUZZARD.‡

There is great variety in the colouring of this bird, scarcely two specimens being similar in plumage. The differences chiefly consist in the depth of the shade of brown on the upper parts, and in a greater or less degree of marking below. The tail is barred, the beak of a lead colour, and the cere, iris, and feet yellow.

The Buzzard is a fine accompaniment to the landscape, whether wild, rocky, or sylvan. It rises often to an immense height, but its flight is slow and majestic, and it utters occasionally a shrill and melancholy whistle. To an observer beneath, and in particular lights, these birds appear of great size; the motions of the tail, when directing the circles they make, may be easily perceived, as well as the beautiful markings on it and the wings, which are sometimes rendered very distinct by the body being thrown upwards, and the light being cast on the clear and silvery tints of the base of the feathers.

The buzzard seldom takes the trouble to make a nest, but contents itself with one deserted by a crow or a magpie, which, if necessary, it enlarges. The eggs are three in number, of a dull white, slightly blotched with brown. If ever furious, it is in defending its young; and it is no common assailant, as its size and strength are very considerable.

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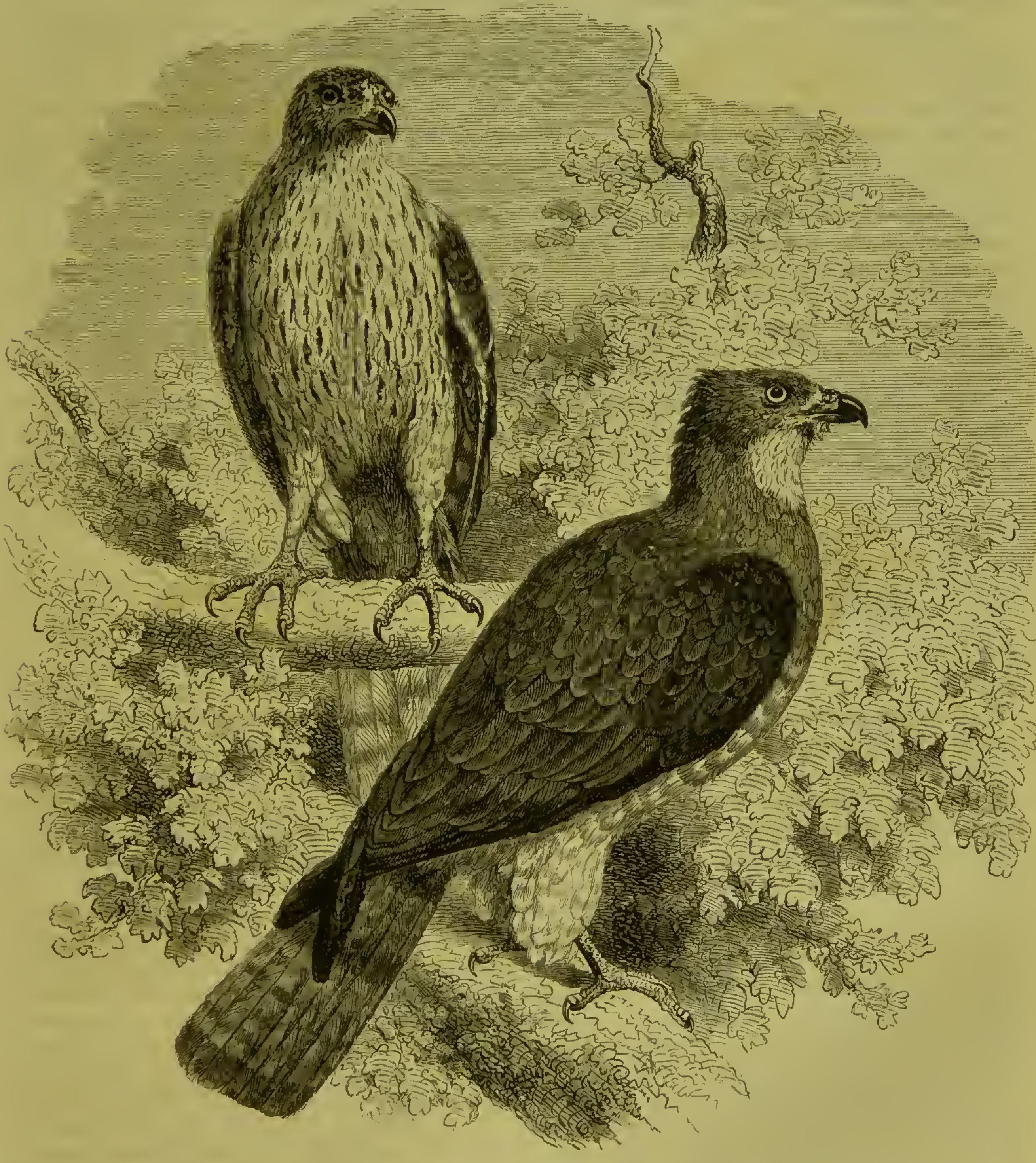
* Falco bidentatus: Latham. † F. Menalopterus. ‡ Buteo vulgaris.

A buzzard was brought to M. Fontaine, in 1763, that had been taken in a snare. At first, it was exceedingly wild, but he undertook to tame it, by leaving it to fast, and constraining it to approach him and eat out of his hand. In this way he brought it to be very familiar, and, after having shut it up for about six weeks, he began to allow it a little liberty, taking the precaution, however, to tie both pinions of its wings, when it walked out into the garden, and returned on being called to feed. After



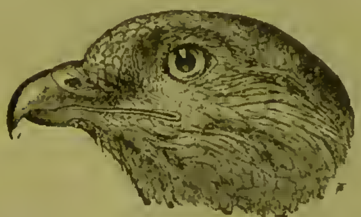
THE COMMON BUZZARD.

some time, from the idea that its fidelity could be trusted, the ligatures were removed, a small bell was fastened above its talons, and there was attached to its breast a piece of copper, bearing its owner's name. It received now its entire liberty, but this it abused, by its flight from St. Pierre to the forest of Belesme; it was even given up for lost, but, four hours after, it rushed into the hall, which was open, pursued by five other buzzards, who had constrained it to seek again its asylum.

Its fidelity was now no further disturbed; it came every night to sleep on its owner's window, and grew so familiar as to seem to take singular pleasure in his company. It attended constantly at dinner; sat on a corner of the table, and very often caressed him with its head and bill, emitting a weak, sharp cry, which, however, it sometimes softened. This privilege was peculiarly its master's; and one day it followed him when he was on horseback, more than two leagues, flying above his head.

Although not the least afraid of dogs and cats, it had to them a strong aversion, and often had tough battles with them, in which it always came off victorious. "I had," says M. Fontaine, "four very strong cats, which I collected into my garden with my buzzard; I threw to them a bit of raw flesh; the nimblest cat seized it, the rest pursued; but the bird darted upon her body, bit her ears with his bill, and squeezed her sides with his talons, so forcibly, that the cat was obliged to relinquish her prize. After another cat snatched it, the instant it dropped, but she suffered the same treatment, till the buzzard got entire possession of the plunder. He was so dexterous in his defence, that, when he perceived himself assailed at once by the four cats, he took wing, and uttered a cry of exultation. At last, the cats, chagrined with their repeated disappointment, would no longer contend."

This buzzard had a singular antipathy to all covered heads. He would not suffer a red cap to be worn by any of the peasants; and so alert was he in whipping it off, that they found their heads unaccountably bare. He also snatched away wigs, but without doing any injury; and he carried these caps and wigs to the tallest tree in the neighbouring park, which was the usual depository of his booty.


HEAD OF ROUGH-LEGGED BUZZARD.

FOOT OF ROUGH-LEGGED BUZZARD.

He would suffer no other rapacious birds to enter his domain, but, attacking them boldly, put them to flight. He did no mischief in the court-yard; and the poultry, which, at first, dreaded him, became gradually reconciled to his presence. Even the chickens and ducklings received no injury, though he bathed with the latter. But, strange to say, he was not equally gentle to the neighbouring poultry, and his owner had often to announce that he would pay for any damage the buzzard did.

However, he was frequently fired at, and, at different times, received fifteen musket shots, without suffering any fracture. But once, early in the morning, hovering over the skirts of a forest, he dared to attack a fox, which, when the keeper observed, he fired two shots at him; the fox was killed, and the buzzard had his wing broken; yet, notwithstanding this fracture, he escaped from the keeper, and was lost for seven days. The man having discovered, from the noise of the bell, that he was M. Fontaine's bird, went the next morning to tell him what had happened. A search was now made near the spot, but he could not be found, nor did he return till seven days afterwards.

M. Fontaine had been used to call him every evening with a whistle, which he did not answer for six days; but on the seventh he heard a feeble cry at a distance, which he judged to be that of his buzzard; he repeated the whistle, and heard the same cry. He now went to the place from whence the sound came; and, at last, found the poor bird with its wing broken. It was found that he had travelled more than half a league on foot to regain his asylum, from which he was then distant about a hundred and twenty paces. Though he was greatly reduced, he gave his owner many caresses. Six weeks elapsed before his wounds were healed and his strength recruited; after which he began to fly as before, and followed his old habits for about a year, when he disappeared and was seen no more.

Of buzzards there are many kinds: we give engravings of the head and foot of one of them.*

The last tribe of the present family consists of the Harriers, which are distinguished from the buzzards by their thin, elongated tarsi, the slenderness of the body, and the length of the tail. The third quill-feather is the longest; the plumage is soft and loose, and it is especially full around the face; it forms, indeed, a sort of ruff, approaching to the disc so conspicuous in the owls; the beak is small and compressed.

THE MARSH HARRIER.†

This, the largest British bird of the family, varies in length from twenty-one to twenty-three inches. It is found not only in England, Scotland, Ireland, and Wales, but also in many parts of northern and southern Europe; and has been observed in Smyrna, Trebizond, Egypt, and Tripoli, and even in the Himalayan Mountains.

Its favourite haunts are heaths and wild, marshy lands. When on the wing it skims the ground, and then drops suddenly on its prey. Moles, mice, rabbits, and various small quadrupeds, together with frogs and other reptiles, become, therefore, its easy spoil. There is often a considerable variety in the tints of this species, and of the predominance or want of white on the head and throat.

THE HEN HARRIER.‡

Not only does age produce a difference in the plumage of the Harriers, but, so great is this difference of plumage in the sexes, as to have caused them, till of late years, to be regarded as distinct species. The female, indeed, obtained the name of the Hen Harrier, while the male was called the Ringtail.

The bird which has retained the former name is spread throughout Europe, it occurs also in some parts of Africa and North America; but everywhere restricts itself to low, flat lands, moors, and heaths.

The full-grown female is about twenty inches long, and three feet and a half in the expanse of its wings. The naked parts are of a yellow hue, but the prevailing colours are brown and dusky white, and the upper part of the head is mottled brown. The concha around the eyes is brown, but terminates on a white eyebrow, which reaches to the cere of the beak, which is white below, but terminates in a brown border, giving to the eye an expression perfectly distinct from that of any other tribe. The feathers below are brown, with pale margins, passing into white at the tale coverts; the upper part is brown, lighter in the scapulars and lesser coverts, and the margins of the feathers are lighter. The tail is brown, with dusky bars, and the quills of the wing of a very deep brown, inclining to black. The breast, head, and all the upper part of the male are of a fine gray; lighter on those parts of the concha which are white in the female, and also where the brown is lighter on the upper part of that bird. The remainder of the under part is white, with very faint markings; yet, notwithstanding these differences, and those of the size and expression of the eyes, the birds exactly correspond in shape and air.

The nest of this species of harrier consists of small sticks and coarse grass, and is placed on the ground. There are four or five eggs, which are either white or of a light blue. There is little or no difficulty in observing this bird in its humble home. Its flight is low, but smooth, graceful, and very swift.

A gentleman, who was shooting in Hampshire, accidentally sprang a pheasant in a wheat-stubble, and shot at it; when, notwithstanding the report of the gun, it was pursued by a hen harrier, but escaped into some covert. He then sprang a second and a third in the same field, and these likewise got away, the harrier hovering around him all the while he was beating the field, conscious, no doùbt, of the game that lurked in the stubble. It appears, therefore, that this bird of prey was rendered very daring and bold by hunger, and that harriers are not always in a condition to strike their game. It may also be observed that they cannot pounce on their quarry when it is on the ground, as it might be able to make a stout resistance; since so large a fowl as a pheasant could not but be visible to the piercing eye of a harrier, when hovering over it. Hence that propensity in game to cowering and squatting till they are almost trodden on, which is evidently designed as one means for their safety.

The last family of the rapacious birds comprehends the Owls.§ They perform, during the night, the same offices which the bolder hunting falcons do in the open day, and serve to keep in check the small quadrupeds, which, like themselves, prowl about in darkness. For this purpose, their vision, though not suited to the glare of noon-day, is acute; their ears readily catch any sound; while their plumage is so soft as to fall gently on the air. Independent of soft and downy feathers, the wings have the webs with plumules disunited at the tips, and are either remarkably pliable, or separated like the teeth of a saw, allowing either a free passage to the air, or so pliable as to yield to its pressure; thus to insure a light, buoyant, and noiseless flight. Yet the proportion of the quills is similar to that belonging to birds of powerful wing, and its use is obvious in the easy, light skimming or sailing near the surface of the ground or cover, which is capable of being for a long time sustained.

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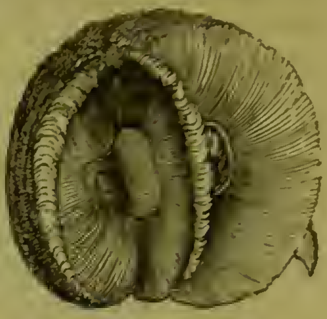
* Buteo lagopus: Linnæus. † Circus rufus: Selby. ‡ Circus cyaneus. § Strigidæ.


EAR OF THE OWL.

Another provision is equally important in the colours of the plumage, which exhibit a union of tints best adapted to concealment. There is nothing marked or obtrusive; so that there are no bright or gaudy hues to catch the eye of an otherwise unwarned prey, but a blending of the more sombre colours, mingling into a neutral tint, yet showing, on close inspection, pencillings the most minute and delicate. The tarsi and feet are, moreover, finely formed for grasping, for the external toe is versatile; so that the foot can be used in scrambling in the interior of some rent or chimney, or in the hollow of a tree, while it also becomes more complete as an organ of prehension.

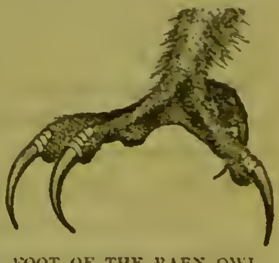
THE BARN OWL.

As the peasant "homeward plods his weary way," it may be that

THE BARN OWL.

> "All the air a solemn stillness holds; * * *
> Save that, from yonder ivy-mantled tower,
> The moping owl doth to the moon complain
> Of such as, wandering near her secret bower,
> Molest her ancient solitary reign."

In such old buildings this bird generally places its rudely-formed nest, and deposits in it its three or four white eggs. The young, who remain there a long time—as long, indeed, as the old ones will bring them mice—are, at first, covered with a white down. Sometimes three different hatches may be found in the same nest, and not unfrequently, eggs also. White, of Selborne, says: "Ever since I can remember, a pair of white owls constantly bred under the eaves of this church. As I have paid good attention to the manner of life of these birds during their season of breeding, which lasts the summer through, the following remarks may not, perhaps, be unacceptable.


FOOT OF THE BARN OWL.

"About an hour before sunset, for then the mice begin to run, they sally forth in quest of prey, and hunt all round the hedges of meadows and small inclosures for them, which seem to be their only food. In this irregular country, we can stand on an eminence, and see them beat the fields over like a setting-dog, and often drop down in the grass and corn. I have minuted these birds by my watch for an hour together, and have found that they return to their nest, the one or other of them, about once in five minutes; reflecting, at the same time, on the adroitness that every animal is possessed of, as far as regards the well-being of itself and offspring.

But a piece of address which they show when they return loaded, should not, I think, be passed over in silence. As they take their prey with their claws, so they carry it in their claws to their nest; but as the feet are necessary in their ascent under the tiles, they constantly perch first on the roof of the chancel, and shift the mouse from their claws to their bill, that the feet may be at liberty to take hold of the plate on the wall as they are rising under the eaves."

Among owls, the "Dukes" are a genus which have the beak short, very strong, and crooked up to the very point. Of this genus, the Grand Duke* is a species which has its head adorned with two horns of feathers, blackish in the centre, but reddish at the extremities. The beak is black, the iris of the eye orange colour. It stands about two feet high. It abounds in Europe and Asia, and feeds on hares, rabbits, moles, rats, mice, and partridges.

THE GRAND DUKE OWL.

THE EAGLE OWL.†

This species is about two feet in length; the upper surface is waved, barred, and dashed with black, on a mingled brown and yellow ground. The throat is white; the under surface yellow, with longitudinal streaks of black on the chest, and fine transverse bars below. The tarsi are feathered to the toes, the iris is bright orange, and the beak and claws black. This splendid bird builds a large nest of sticks, in the crevices of rocks, in old ruined castles, or in hollow trees. The eggs are three in number, and white. This bird is of rare occurrence in England and France, but it dwells among the deep recesses of vast forests in Norway, Sweden, Russia, or Hungary, or in the clefts of rocks, or the desolate ruins of ancient towers. Temminck says it is found at the Cape of Good Hope. Willoughby observes that about Bologna, and elsewhere in Italy, it is frequent. Bonaparte notes it as rare in the neighbourhood of Rome, and says that it is seen only in mountainous situations. It is stated to extend eastward as far as Kamschatka.

As evening comes on, it skims through the wood on silent wing, and marks the fawn, the hare, or the rabbit, nibbling the herbage, as, concealed by the broad shadows, it skirts the line of black, dark foliage. Suddenly wheeling, it sweeps on the unsuspecting victim, and bears it off, if not too large, eagle-like, in its talons. Smaller prey, such as rats, mice, squirrels, and frogs, it crushes with its bill into a mass, swallows them entire, and ejects pellets, called "castings," the rolled skin, bones, feathers, or hair.

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* Bubo Europæus.

† Bubo maximus.

THE SNOWY OWL.*

The forlorn mountains of Greenland, covered with eternal ice and snow, furnish food and shelter to this hardy adventurer, whence he is only driven by the extreme severity of the weather towards the sea-shore. He is found in Lapland, Norway, and the country near Hudson's Bay, during the whole year; is said to be common in Siberia, and numerous in Kamschatka. He is often seen in Canada and the northern districts of the United States, and sometimes visits the borders of Florida.

THE SNOWY OWL.

So secure is this bird rendered by the Creator from the attacks of cold, that no one point is left exposed. The bill is almost hidden in a mass of feathers that cover the face; the legs are clothed with such long, thick, hair-like plumage, as to appear nearly as large as those of a middle-sized dog, the claws only being visible; these are large, black, much hooked, and extremely sharp. The entire plumage below the surface is of the most exquisitely soft, warm, and elastic kind, and so closely matted together as to make it a difficult matter to penetrate to the skin.

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* Noctua Nyctea.

EAGLE OWLS.

THE BURROWING OWL.*

Prince Bonaparte has described this bird, which is a native of "the Trans-Mississippian territories of the United States, and which resides exclusively in the villages of the marmot or prairie-dog" (Viscacha), "whose excavations are so commodious as to render it unnecessary that our bird should dig for himself, as he is said to do in other parts of the world, where no burrowing animals exist. These villages are very numerous, sometimes covering only a few acres, and at others spreading over the surface of the country for miles together. They are composed of slightly elevated mounds, having the form of a truncated cone, about two feet in width at the base, and seldom rising so high as eighteen inches above the surface of the soil. The entrance is placed either at the top or on the side, and the whole mount is beaten down externally, especially at the summit, resembling a much-used footpath.

DOVES AND OWL.

"In all these prairie-dog villages, the burrowing owl is seen moving briskly about, or else in small flocks scattered among the mounds, and at a distance it may be mistaken for the marmot itself, when sitting erect. They manifest but little timidity, and allow themselves to be approached sufficiently close for shooting; but if alarmed, some or all of them soar away again and settle down at a short distance; if further disturbed, their flight is continued until they are no longer in view, or they descend into their dwellings, whence they are difficult to dislodge. The burrows into which these owls have been seen to descend, on the plains of the river Platte (Plata), where they are most numerous, were evidently excavated by the marmot; whence it has been inferred by Say, that they were either common, though unfriendly, residents of the same habitation, or that our owl was the sole occupant of what it had acquired by the right of conquest. The evidence of this was clearly presented by the ruinous condition of burrows tenanted by the owl, which were frequently caved in and their sides channelled by the rains; while the neat and well-preserved mansion of the marmot showed the active care of a skilful and industrious owner. We have no evidence that the owl and marmot habitually resort to one burrow; yet we are well assured by Pike and others, that a common danger often drives them into the same excavation, where lizards and rattlesnakes also enter for concealment and safety." It appears, however, from recent observations, that the prairie-dog is the prey of the so-called burrowing owl.*

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* Strix cunicularia: C. L. Bonaparte.

THE VIRGINIAN HORNED OWL.†

THE VIRGINIAN HORNED OWL.

Sir John Richardson thinks that this night bird, peculiar to America, inhabits that continent from end to end. Wilson thus describes its haunts and habits: "His favourite residence is in the dark solitudes of deep swamps, covered with a growth of gigantic timber; and here, as soon as evening draws on, and mankind retire to rest, he sends forth such sounds as seem scarcely to belong to this world, startling the solitary pilgrim as he slumbers by his forest fire,

'Making night hideous.'

"Along the mountainous shores of the Ohio, and amidst the deep forests of Indiana, alone, and reposing in the woods, this ghostly watchman has frequently warned me of the approach of morning, and amused me with his singular exclamations, sometimes sweeping down and around my fire, uttering a loud and solemn 'Waugh O! Waugh O!' sufficient to have alarmed a whole garrison."

Early in February, the great horned owls are seen to pair. The curious evolutions of the male on the wing it is impossible to describe. Extremely ludicrous are his bowings and the snappings of his bill; but no sooner is the female assured that his attentions are sincere and affectionate, than she joins in his emotions and becomes his mate.

The length of the male is twenty inches; the bill is large, black, and strong, covered at the base with a cere; the eyes golden yellow; the horns are three inches in length and very broad, their webs black, broadly-edged with bright tawny; the face rusty, bounded on each side by a band of black; the whole lower parts elegantly marked with numerous transverse bars of a dusky colour on a bright tawny ground, thinly interspersed with white. The female is full two feet in length, and the white on her throat is not so pure as on that of the male. She has also less of the bright ferruginous or tawny tint below, but is principally distinguished by her superior size.

The nest, which is very bulky, is usually fixed on a large horizontal branch, and far from the trunk of the tree. It is formed externally of crooked sticks, and is lined with coarse grasses and feathers. There are from three to six eggs, almost globular in form, and of a dull white colour.

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* See Mammalia, Vol. II.—The Prairie Dog.

† Bubo Virginianus.

PERCHING BIRDS.*

The scientific name assigned to these birds is, as Cuvier observed, of a negative kind. They are not rapacious, like those that have just been considered, nor are they like those that will follow, gallinaceous, nor to be described as waders, climbers, or swimmers. And though it is difficult to establish rigid sub-divisions, yet a general similarity of structure, and an insensible melting of one group into another, may be easily traced. Exceedingly numerous, they have been divided into four tribes, each of which we shall now proceed to examine.

The name of the First Tribe† alludes to the wide gape of the bill, a remarkable feature in all the subjects of this section, so that, with other provisions of structure, they can take their food on the wing.

Goat-sucker is the English name of these Night-swallows, commonly called Night-jars; whence the name by which the first family is generally known among naturalists.‡

THE COMMON GOAT-SUCKER.§

This is a bird of nocturnal habits. Its eyes are large; its plumage full, soft, and downy; its gape enormous; its wings long; its tarsi very short and generally feathered; three of its toes are before, and there is one behind, but this can be brought forward; and the nail of the middle, in most species, is pectinated on its internal edge. The female has the plumage of the male generally, but she wants the white spots he has on the quills and tail-feathers.

Aristotle speaks of "a mountain-bird, a little larger than the blackbird, and a little less than the cuckoo. It lays eggs to the number of two or three at most, and is of a slothful nature. Flying upon the goats, it sucks them, whence it has its name. They say, that when it has sucked the teat it becomes dry, and that the goat becomes blind. It is not sharp-sighted by day; but it sees by night." Ælian also refers to the absurd story of the goat-sucking habits of this bird, which may probably be referred to a still earlier date.

Gilbert White alludes to the prejudice of his own time, that this bird was very injurious to weanling calves, by inflicting, as it strikes at them, the fatal distemper known to cow-leeches by the name of "puckeridge." "But the truth of the matter is," he says, "the malady is occasioned by the *Œstrus bovis*, a dipterous insect, which lays its eggs along the chines of kine, where the maggots, when hatched, eat their way through the hide of the beast into the flesh, and grow to a very large size."

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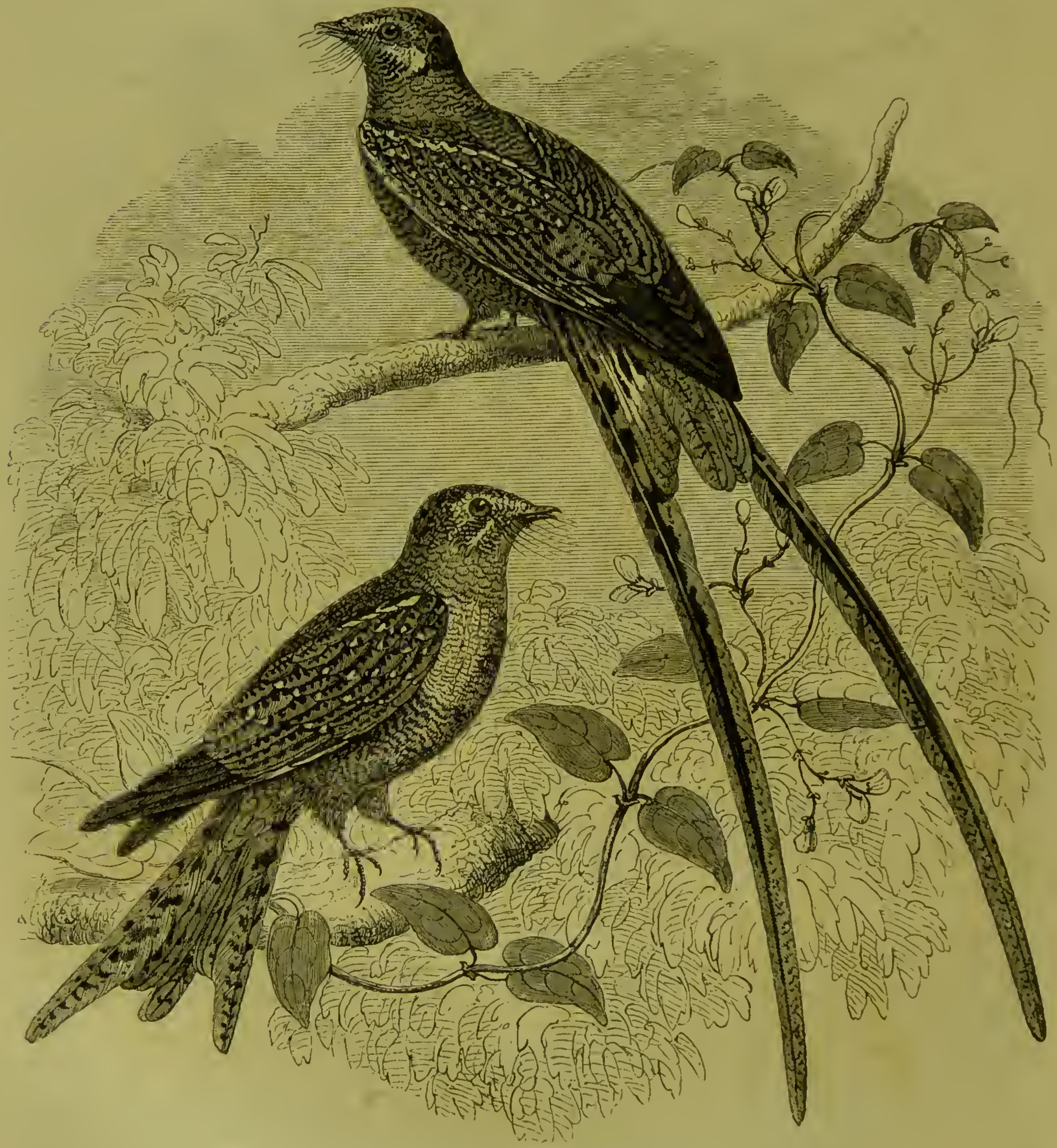
* Passeres: Linnæus. Insessores: Vigors.

† Fissirostres.

‡ Caprimulgidæ.

§ Caprimulgus Europæus.

The birds live in solitary retreats, whence they emerge on noiseless wing, chasing the insects which, like themselves, sport in the murky twilight. The blended hues of gray and brown, which decorate their plumage, well accord with the shades of evening, and thus favour their concealment. So wide is their gape, that they cannot miss their prey; and, to prevent its struggles, the edges of the mandibles are provided with a row of stiff bristles.



THE FORK-TAILED GOAT-SUCKER.

The following is a very remarkable specimen of the family now under consideration.

THE WHIP-POOR-WILL.*

A STRANGER must be conscious of a novel sensation, as, walking in Pennsylvania towards the close of April, as the dusk commences or as the day breaks, he hears these words clearly articulated for the first time. The notes of this solitary bird first issue from some retired part of the woods, the glen, or the mountain; in a few evenings, perhaps, they are heard from the adjoining coppice, the garden-fence, the

THE WHIP-POOR-WILL.

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* Caprimulgus vociferus.

road before the door, and even from the roof of the dwelling-house, long after the family have retired to rest. Some of the superstitious consider these visits to forebode no good to the household; but, as they continue to take place without the slightest injury arising, this ignorant dread is on the decline.

In due time this bird becomes a regular acquaintance. Every morning and evening his shrill and rapid repetitions are heard from the neighbouring woods; and when two or more are calling out at the same time, as frequently occurs in the pairing season, and at no great distance from one another, the noise, mingling with the echoes from the mountains, is truly surprising. Strangers in parts of the country where these birds are numerous, find it, for a time, almost impossible to sleep; while to those long acquainted with them, the sound often serves as a lullaby to assist their repose.

The first and last syllables of the words "whip-poor-will" are uttered with great emphasis, and the whole in about a second to each repetition; but when two or more males meet, their "whip-poor-will" altercations become much more rapid and incessant, as if each were striving to overpower or silence the other. When near, an introductory cluck may be heard between the notes. They generally fly low, not more than a few feet from the surface, skimming about the house and before the door, alighting on the wood pile, or settling on the roof. Towards midnight they generally become silent, unless in clear moonlight, when they may be heard, with little intermission, till morning. If there be a creek near, with high, precipitous, bushy banks, they are sure to be found in such situations.

During the day they sit in the most retired, solitary, and deeply-shaded parts of the woods, generally on high ground, where they repose in silence. When disturbed, they rise within a few feet, sail low and slowly through the woods for thirty or forty yards, and generally settle on a low branch or on the ground. Their sight appears deficient during the day, as, like owls, they seem to want that vivacity for which they are distinguished in the morning and evening twilight. They are rarely shot at or molested; and, from being thus transiently seen in the obscurity of dusk, or the deep shadows of the woods, no wonder that the particular markings of their plumage should be so little known, or that they should be confounded with the night-hawk, which, in general appearance, they so much resemble.

The female begins to lay about the second week in May, selecting, for this purpose, the most unfrequented part of the wood, often where some brush, old logs, or heaps of leaves had been lying, and always in a dry situation. The eggs are deposited on the ground, or on the leaves; not the slightest appearance of a nest being visible. These are usually two in number, having a dark ground-colour, and thickly mottled with dark olive.

We add only one other specimen of this interesting family: it is the Fork-tailed Goatsucker, a native of the Brazils, distinguishable at once from others by the extent and forked termination of the tail, which it opens and shuts during its flight.

The genus *podargus* differs from that of *caprimulgus* in some important respects. The beak is larger and longer, having a wider gape; the head is considerably larger, and the whole bird is of superior size. Thus the Horned Podargus of Sumatra* might, from the shape of the head, the large, staring eyes, and the plumelets into which the ear-coverts are elongated, be easily mistaken for an owl, especially also as its nocturnal habits would countenance and confirm the presumption. The *podargus cinereus* of Vieillot is a good illustration of the genus. It is found chiefly in New Holland and Tasmania. It is nocturnal in its habits, finding its haunts in the forest retreats, where, seated on the lower branches of a tree, not far from the trunk, and with its feathers raised, it passes the day. So profound is its immovability and apparent insensibility, that it may almost be taken by the hand; but as soon as the twilight of evening returns, it goes forth in pursuit of prey, which it continues till about two hours before sunrise the following morning. The nest is roughly built of small sticks and grass, and the female lays from two to four eggs.

The *nyctibius grandis*† of Vieillot is a remarkable specimen of this race. Its plumage is red, and is divided by oblique and irregular black bands, partially marked with white marks; the feet are flesh-colour.

The *steatornes caripensis*‡ was discovered in America by Humboldt and Bonpland, on their excursions to the mountains of Caripe, in Cumana. Here they entered an immense cavern, where a curious sight and still more strange sounds awaited them. We are assured that it is, indeed, very difficult to form an adequate conception of the frightful noise which smote upon their ears, from the thousands of birds who dwelt in this dark abode, and the sounds they uttered were re-echoed in the caverns around. The Indians, who guided the visitors, fixed their torches at the end of long poles, and thus showed the nests of the birds, which were fifteen or sixteen feet overhead. The noise of the terrified inmates increased as the intruders advanced; and when, at length, it ceased for some minutes around the travellers, the same doleful cries might be heard sounding through the other caverns, which extended in various directions. The Indians enter these caves once a-year, armed with poles, with which they destroy the greater part of the nests. They also kill many thousands of the birds; and the old ones, as they defend their broods, hover around the heads of the assailants, and utter the most melancholy cries.

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* Podargus cornutus.

† Nyctibius grandis: Vieillot.

‡ Humboldt.

The Second Family of this tribe* has the same kind of beak, and the same width of gape, as the goatsuckers, but the beak is broader at the base and more compressed; nor is it provided along the edges with such a row of bristles. The tarsi are extremely short and small, and the toes have sharp hooked nails, for the purpose of clinging to walls or the sides of rocks. In the swifts, for example, all four toes are directed forwards: in the true swallows only the hind toe is reversible.

THE SWIFT.

This bird, which usually comes to this country from Africa early in May, and leaves us, generally, by the middle of August, is the largest of our swallows. Its weight, however, appears disproportionately small to its extent of wing: the former being scarcely one ounce, the latter eighteen inches: the length is nearly eight inches. The feet are so small, that the action of walking and rising from the ground is extremely difficult, but it is furnished with ample means for an easy and continual flight. It is more on the wing than any other swallow; its flight is more rapid, and it is attended with a shrill scream.

THE SWIFT.

It breeds under the eaves of houses, in steeples, and other lofty buildings; makes its nest of grasses and feathers, and lays only two eggs, of a white colour. It is entirely of a glossy dark, sooty colour, only the chin is marked with a white spot. It rests by clinging against some wall or other suitable body. The fabulous history of the Bird of Paradise is greatly verified in this species. The Bird of Paradise was believed to have no feet; to live on the celestial dews; to float perpetually in the Indian air, and to perform all its functions in that element. The Swift actually performs what has now been disproved of the former; for, except the small time it takes in sleeping, and what it devotes to incubation, every other act is done on the wing.

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* Hirundindiæ.

The materials of its nest it collects either as they are carried about by the wind, or picks them up from the ground in its sweeping flight. The insects that fill the air are, undeniably, its food. Its drink is taken in transient sips from the water's surface. Often are they seen, on a fine summer's morning, making their aerial course at a great height, encircling a certain space with an easy, steady motion; then, on a sudden, falling into each other's embraces, and dropping precipitately, with a loud shriek, for numbers of yards. These birds and swallows are inveterate enemies to hawks. The instant one appears, they begin their attack; the swifts soon desist, but the swallows pursue and persecute the rapacious bird till it is entirely driven away.

Swifts appear to be spread over Europe in the breeding season. They visit Lapland, Norway Denmark, and Sweden. Mr. Yarrell states that he has never seen the swift in any collection brought from India. Montague extends its southward range in Africa as far as the Cape. It has been noticed at Madeira. Temminck limits it to the tropics.

THE SWALLOW.*

Many lovers of Nature will find the expression of feelings, often entertained, in the following verses:

"Welcome, welcome, feather'd stranger,
Now the sun bids Nature smile;
Safe arrived, and free from danger,
Welcome to our blooming isle!
Still twitter on my lonely roof,
And hail me at the dawn of day,
Each morn the recollected proof
Of Time that ever fleets away.

"Fond of sunshine, fond of shade,
Fond of skies serene and clear;
E'en transient storms thy joy invade
In fairest seasons of the year.
What makes thee seek a milder clime?
What makes thee shun thy wintry gale?
How know'st thou thy departing time?
Hail! wondrous bird! hail, swallow, hail!

"Sure something more to thee is given
Than myriads of the feather'd race,
Some gift divine, some spark from Heaven,
That guides thy flight from place to place.
Still freely come, still freely go,
And blessings crown thy vigorous wing;
May thy rude flight meet no rude foe,
Delightful messenger of spring!"

"The swallow," says Sir H. Davy, in his "Salmonia," "is one of my favourite birds, and a rival of the nightingale; for he glads my sense of seeing as much as any other does my sense of hearing. He is the joyous prophet of the year—the harbinger of the best season: he lives a life of enjoyment among the loveliest forms of Nature; winter is unknown to him; and he leaves the green meadows of England in autumn for the myrtle and orange groves of Italy, and for the palms of Africa; he has always objects of pursuit, and his success is secure. Even the beings selected for his prey are poetical, beautiful, and transient. The ephemeræ are saved by his means from a slow and lingering death in the evening, and killed in a moment, when they had known nothing of life but pleasure. He is the constant destroyer of insects—the friend of man; and, with the stork and the ibis, may be regarded as a sacred bird. The instinct which gives him his appointed seasons, and which teaches him always when and where to move, may be regarded as flowing from a Divine source; and he belongs to the oracles of Nature, which speak the awful and intelligible language of a present Deity."

Though the flight of this bird is low, it is extremely rapid, while the observer is often astonished by its sudden turns and evolutions. All the day long, as if absolutely unwearied, does the swallow skim over fields and meadows, and the surface of pools and sheets of water. There, indeed, is a profusion of food, and most skilfull does it dip beneath, emerge with its insect prey, and then shake the spray from its burnished plumage; feeding, drinking, and bathing alike on the wing.

Its nest is formed of clay, rendered tenacious and plastic by its saliva, for which it is provided with salivary glands of an unusual size. The dwelling is lined with fine grass and feathers, and firmly fixed at some depth inside a chimney, or against the rafters of barns and out-houses. Many a nest has been thus built in some out-buildings of the house where the writer lives, and often has he watched the parent birds rushing suddenly through some aperture in the wall, which has been purposely left in its erection, and having fed their young with the prey borne in their beaks, as suddenly and hastily bound away in pursuit of more.

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* Hirundo rustica.

With deep interest, too, has he watched, as summer is about to close, the preparations for the early departure of the parents with their young. It is as if some signal had been given for the congregating of multitudes of swallows. Flocking in from all quarters, they perch at night in clusters on barns or the branches of trees; and followed to the reeds of marshes and fens, they may be seen to wheel, and sink, and rise again, before they finally settle, all the time twitting vociferously.

"Five or six of these birds," says Bewick, "were taken about the latter end of August, 1784, in a bat fowling-net at night; they were put separately into small cages, and fed with nightingale's food; in about a week or ten days they took food of themselves, and seemed much strengthened by it; they were then put all together into a deep cage, four feet long, with gravel at the bottom; a broad shallow pan was placed in it, in which they sometimes washed themselves. One day Mr. Pearson observed that they went into the water with unusual eagerness, hurrying in and out again repeatedly with as much swiftness as if they had been suddenly seized with a frenzy. Being anxious to see the result, he left them to themselves about half an hour, and, going to the cage, found them all huddled together in a corner, apparently dead; the cage was then placed at a proper distance from the fire, when only two of them recovered, and were as healthy as before; the rest died. The two remaining were allowed to wash themselves occasionally for a short time only, but their feet soon after became swelled and inflamed, which Mr. Pearson attributed to their perching, and they died about Christmas; thus the first year's experiment was in some measure lost. Not discouraged by the failure of this, Mr. Pearson determined to make a second trial the succeeding year, from a strong desire of being convinced of the

CHIMNEY SWALLOWS.

truth respecting their going into a state of torpidity. Accordingly, the next season, having taken some birds, he put them into the cage, and in every respect pursued the same method as with the last; but, to guard their feet from the bad effects of the damp and cold, he covered the perches with flannel, and had the pleasure to observe that the birds throve extremely well; they sung their song during the winter, and soon after Christmas began to moult, which they got through without any difficulty, and lived three or four years, regularly moulting every year at the usual time. On the renewal of their feathers, it appeared that their tails were forked exactly the same as in those birds which return hither in the spring, and in every respect their appearance was the same."

It has been, however, sagaciously conjectured by Dr. Foster, that those birds which have been found in a state of torpidity—in the crevices of rocks, in holes of old decayed trees, in ruined towers, and under the thatch of houses—had, owing to some accident, been hatched later in the year than ordinarily, and consequently had not acquired sufficient strength to undergo the fatigue of a long journey on the wing, at the time when the migration of the rest of their species took place; and that, to shelter themselves from the inclemency of the weather, they had sought retreats wherein, from cold and hunger, they had sunk into a state of torpidity.

Burns pathetically asks—

> "Ilk happing bird, wee helpless thing,
> Which, in the merry months of spring,
> Delighted me to hear thee sing,
> What comes o' thee?
> Where wilt thou cower thy chittering wing,
> And close thy e'e?"

But, in a multitude of instances, the inquiry must remain unanswered. In the mode of migration, however, we know there is a great diversity. The males in certain cases travel first, and are afterwards followed by their mates and the younger branches of their families. Most birds perform their migrations during the night; but there are some that travel only by day, and others that fly onwards, unaffected alike by night or day. The owl, the blackbird, and a great number of aquatic birds, shun the light; while the crow, the pie, the titmouse, the wren, the woodpecker, the chaffinch, the goldfinch, the lark, the swallow, and some others, avail themselves of it. And as the heron, the wagtail, the yellowhammer, the stork, the crane, the plover, the swan, and the wild goose, do not intermit their flight, they choose a bright moonlight season to set out on their journey.

It appears likely, however, that the great object of migration is the same: to find food in other climes for the young broods, which the season of autumn denies them in ours.

An interesting fact may conclude this account. The young tutor of the children of Count Héricy, residing in an old château in the Pays de Caus, at Fiquainville, was accustomed early in the morning to inhale the fresh air of the garden into which his window opened. One morning he observed two swallows building a nest in the outer angle of his small casement; the male bringing moist clay in his beak, which the hen kneaded together, and with straws and bits of hay formed their cozy home. As soon as the framework was completed, the pair hastened to line the interior with feathers, wool, and dried leaves; and then, winging their flight to a neighbouring wood, they continued absent for several days.

As, however, the nest was in the course of building, two sparrows looked on with great curiosity, and no sooner had the swallows departed, than they took possession of the vacant domicile, always leaving one on the watch with his sturdy bill protruded through the entrance.

At length the swallows returned, when the cock made an indignant attack on the intruders, only, alas! to endure a bleeding head and ruffled feathers; and so, after a short colloquy with his mate perched on a green bough, they withdrew again together. On the return of the hen-sparrow, the young tutor thought that her husband gave her an account of the attack and the repulse, over which they chuckled; and then he saw them sally forth and store up a large stock of provisions, with *two* beaks ready to defend the entrance.

But now cries resounded in the air; crowds of swallows began to assemble on the roof; in the midst he perceived the expelled builders, recounting their wrongs to each fresh arrival; and before long two hundred of these birds were assembled. Suddenly a host of them flew against the nest—still defended by the two sturdy beaks—each having his bill filled with mud, which he discharged against the entrance, and then gave place to another to follow up the assault; while this they so managed to accomplish as to keep at a short distance from the nest, and be out of the reach of the besieged sparrows. The swallows now heaped mud on the nest till it was completely covered, and but for the desperate efforts of the sparrows, who contrived to shake off some of the pellets, the opening would have been soon quite choked up. But brief indeed was the interval; for a party of the swallows perched on the nest, smoothed and pressed down the clay over the opening, and soon hermetically closed it; when loud cries arose of vengeance and victory.

Another work was yet to be done. The swallows hurried away for fresh materials; of these they constructed a nest over the blocked-up entrance, and in two hours it was occupied by the ejected swallows. No wonder the young tutor looked on with increasing interest: he observed the development of the young brood; the male bird teaching them how to seize their prey in the air; how to fly high when all was still, and the flies sported aloft; and how to keep near the ground when a storm was coming, for then all insects seek a shelter. So passed the summer, and autumn came. Crowds of swallows once more assembled on the roof of the château; the little birds were placed with other little birds in the midst of the troop; and ere long they all took a flight towards the east.

Spring came, and two swallows, lean and with ruffled feathers, came with it, and were recognised as the parents of the last year's brood; they repaired and re-lined the nest, and then set out on an excursion as in the previous season. The morning after their return, a hawk pounced suddenly on the cock, and would have borne him away had not the young tutor mortally wounded the assailant with a fowling-piece. The swallow was seriously wounded by the talons of the hawk, and a grain or two of shot had grazed his breast and broken one wing, but the kind young man dressed his wounds, and replaced him in the nest, while the poor hen fluttered sadly around her mate, uttering piercing cries of distress. In spite of every attention, he soon died; from that moment the hen never left her nest, refused the food that was constantly offered her, and expired five days after her beloved mate. These passages in a bird's history awakened in the mind of that young man an inextinguishable interest in Natural History; and often did he relate them when he had attained a world-wide fame as Baron Cuvier.

THE SAND MARTIN.

THE SAND-MARTIN.*

In the banks of rivers, and in the perpendicular sides of sand-pits, these birds dig themselves round and regular holes, about two feet in depth, which run horizontally, and in a somewhat serpentine direction. At the farther end of these burrows they construct a rude nest of grass and feathers.

"Though no one," says Gilbert White, "would be disinclined to believe that this weak bird, with her soft, tender bill and claws, should ever be able to bore the stubborn sand-bank without entirely disabling herself, yet with these feeble instruments have I seen a pair of them make great dispatch, and could remark how much they had scooped in a day, by the fresh sand which ran down the bank, and which was of a different colour from what lay loose and had been bleached in the sun. In what space of time these little artists are able to mine and finish these cavities, I have never been able to discover; but it would be a matter worthy of observation, where it falls in the way of any naturalist to make such remarks.

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* Hirundo riparia: Linnæus.

"This I have often taken notice of, that several holes of different depths are left unfinished at the end of the summer. To imagine that these beginnings were intentionally made, in order to be in the greater forwardness for the ensuing spring, is allowing perhaps too much foresight to a simple bird. May not the cause of these being left unfinished arise from the birds meeting in those places with strata too hard, harsh, and solid, for their purpose; which they relinquish, and go to a fresh spot that works more freely? Or may they not in other places fall in with a soil as much too loose and mouldering, liable to flounder, and threatening to overwhelm them and their labours? One thing is remarkable—that, after some years, the old holes are forsaken, and new ones bored; perhaps because the former habitations were become foul and fœtid from long use, or because they so abounded with fleas as to become untenable."

The only tool with which this bird is provided is its beak, which, however, is peculiarly hard, and tapers suddenly to a point from a broad base. With this it proceeds to work, picking away from the centre to the circumference of the opening, which is nearly circular; thus it moves round and round, the gallery being more or less curved in its course, and having a narrow funnel-shaped termination. Clinging with its sharp claws to the face of a sand-bank, it plies its bill as a miner does his pickaxe, till it has loosened a considerable portion of the sand and thrown it down among the rubbish below.

THE ESCULENT SWALLOW.*

A SMALL swallow—a small species, not unlike the sand martin—makes his nest from several kinds of moss, and among them it is said from the Ceylon moss, in the highest and most inaccessible rocks, in deep, damp caves. Craufurd states, that none but those accustomed to the dangers it offers can pursue the occupation of collecting these nests; for they are only approachable by a particular descent of many hundred feet, by ladders of bamboo and ratan, over a sea rolling violently against the rocks. When the mouth of the cave is attained, the perilous task of taking the nests must be performed by torch-light, by penetrating into the recesses of the rock, where the slightest slip would instantly be fatal to the adventurers, who can see nothing below them but the turbulent surf making its way into the chasms of the rocks. The high price given for these delicacies is, however, a sufficient inducement for the gatherers to follow this "dreadful trade."

The nests, formed of a mucilaginous substance, resemble ill-concocted fibrous isinglass, and are of a white colour, inclining to red; their thickness little more than that of a silver spoon, and the weight from a quarter to half an ounce. When dry, they are brittle and wrinkled, the size being nearly that of a goose's egg. The qualities of the nest vary, according to the situation and extent of the caves in which they are found, and the time at which they are taken; if procured before the eggs have been laid, the nests are of the best kind; if they contain eggs only, they are still valuable; but if the young are in the nest or have just left it, they are nearly worthless, being dark-coloured, streaked with blood, and intermixed with feathers and dirt.

After they are procured, they are separated from feathers and dirt, are carefully dried and packed, and are then fit for the market. The best sort in China are sent to Pekin, for the use of the Emperor. The labour bestowed upon them to fit them for the table is enormous; every stick, every feather, every impurity, whatever is its kind, is carefully removed, and then, after undergoing many washings and preparations, they are made into a soft, delicious jelly, and they are likewise served up in broths and soups. They have the reputation of being nutritious and gently stimulating. The extravagant prices given for these nests by the Chinese make them a most expensive article of diet. Meyen, in his "Voyage Round the World," states that the Japanese had long ago discovered that these costly birds' nests were nothing more than softened sea-weed, and that they prepare the substance itself in an artist-like manner.

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* Hirundo esculenta.

THE MARTIN.*

In its general habits, this bird, sometimes called the Martlet, resembles the swallow. It is, however, several days later in its appearance, nor is it either so active or vigorous on the wing, but skims along more smoothly, and its evolutions are fewer and less rapid, yet it glances over sheets of water, into which it dips in its progress.

THE ESCULENT SWALLOW.

* Hirundo urbica: Linnæus.

The Martin fixes its nest under the eaves of houses and barns, and sometimes among the carved work of Gothic buildings and towers, or against the precipitous sides of rocks. Rows of these little dwellings are often observable, and in some instances they are found forming a continuous series. This bird is, therefore, manifestly more gregarious than the swallow; multitudes generally forming a colony, occupying their old dwellings year after year, and uniting in expelling and driving away sparrows and other intruders.

This bird may be known by having a tail less forked than others, and by the pure white of the rump, breast, and under surface, while the head and back are of a purplish black. The tarsi are covered with white down to the very claws. The crust of the nest is made of clay moistened with saliva, and lined with feathers. A small aperture allows of the exits and entrances of the parent birds; and the fledged young, too weak to fly, may often be seen—for they are of a race favoured by man—eagerly stretching forth their heads for the coming food. The martin often breeds thrice in a season, having four or five young each time of incubation; it leaves our island about the beginning of October, but a few sometimes remain over the first week in November.

THE MARTIN.

Another species,* the Linchi of the Javanese, constructs its nests of mosses and lichens, connected by the same glutinous substance which composes the nest of the swallow just described.

THE PURPLE MARTIN.†

The male bird is of a dark bluish glossy purple; the wings and forked tale are brownish black. The female and young are bluish brown, and have the belly whitish. The tale is considerably forked.

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* Hirundo fucifaga.

† Hirundo purpurea.

This beautiful species, found in the United States and Canada, like many others of the family, seeks out the dwellings of man, associating himself equally with the aboriginal and the colonist, the master and the slave. To the Purple Martin it is indifferent whether his mansion be carved and painted, or humbled into the hospitable shed of a calabash or gourd. Secure of an asylum for his mate and his young, while under the care of man, he twitters forth his gratitude, and is everywhere welcome to a home. So eager is he to claim such protection, that sometimes he ventures on hostilities with the blue birds and domestic pigeons, often forcing them to abandon their hereditary claims. The purple martins, satisfied with their reception and success, return year after year to the same station.

THE SORDID THRUSH.*

This species is a native of Australia, and the situation of the nest is very much varied. Mr. Gould describes it as rather shallow, of a rounded form, about five inches in diameter, and composed of fine twigs neatly lined with fibrous roots. He saw one placed in a thickly-leaved bough near the ground, while others were in a naked fork, in the side of the bole of a tree, in a niche formed by a portion of the bark having been separated from the trunk. The eggs, which are generally four in number, differ in the disposition of their markings.

Mr. Gould mentions an extraordinary habit of this bird. He says, "This feature was not seen by me, but by my assistant, Mr. Gilbert, during his residence at Swan River; and I have here given his account in his own words:—'The greatest peculiarity in the habits of this bird is, its manner of suspending itself in perfect clusters, like a swarm of bees; a few birds suspending themselves on the under side of a dead branch, while others of the flock attach themselves one to the other, in such numbers, that they have been observed nearly the size of a bushel measure.' It was very numerous in the town of Perth, until about the middle of April, when I missed it suddenly; nor did I observe it again until near the end of May, when I saw it in countless numbers, flying in company with the common swallows and martins, over a lake about ten miles north of the town; so numerous, in fact, were they, that they darkened the water as they flew over it." The representation of the clustering of these birds, as given by Mr. Gould, reminds one of a swarm of bees.

Another family is formed of the Todies,† of which there is, however, no European representative. They are characterised by a peculiar flatness or depression of the bill, which is more or less garnished with a row of hairs at its base. They frequent the borders of marshes and rivers, and feed on the softer kinds of insects, which they take on the wing.

THE GREEN TODY.‡

Scarcely exceeding in size an English wren, this very beautiful little bird has a bill which is nearly three-quarters of an inch in length, is very flat, but has a slightly raised ridge running down its whole length. A beautiful green adorns the upper surface of the body, the lower part is yellowish white, the sides over the thighs are rose-colour, and on the throat there is a fine spot of red.

While perched upon a branch, with its feathers ruffled, and its beak in the air, it has an attitude which appears anything but indicative of activity or grace; but it is, at the same time, quietly on the alert, and, should an insect come within sight, it sweeps after it with unerring certainty. Its nest is formed on the ground, in which the female deposits four bluish-coloured eggs. The song of the male is very pleasant during the pairing season; at other times, it is only a sad cry, often repeated.

In the island of Jamaica, the Tody is a very common bird. On the summit of Bluefields Mountain, about 3,000 feet from the level of the sea, and particularly where the deserted provision grounds are overgrown with an almost impenetrable thicket of jointer, or jointwood, Mr. Gosse tells us it is especially abundant. Always conspicuous from its bright grass-green coat and crimson velvet gorget, it is still a very tame bird, allowing a person to approach very near, and, if disturbed, alighting on another twig a few yards distant. That eminent naturalist says, "I have never seen the tody on the ground; but it hops about the twigs of low trees searching for minute insects, occasionally uttering a querulous sibilant note. It is instructive to observe how various are the means by which the wisdom of God has ordained that a given end should be attained. The swallow and the tody live on the same prey, insects on the wing; and the short, hollow, and feeble wings of the latter are as effectual to him as the long and powerful pinions are to the swallow. He has no powers to employ in pursuing insects, but he waits till they come within his circumscribed range, and no less certainly secures his meal." We give an engraving of the finely-crested bird, the King Tody.

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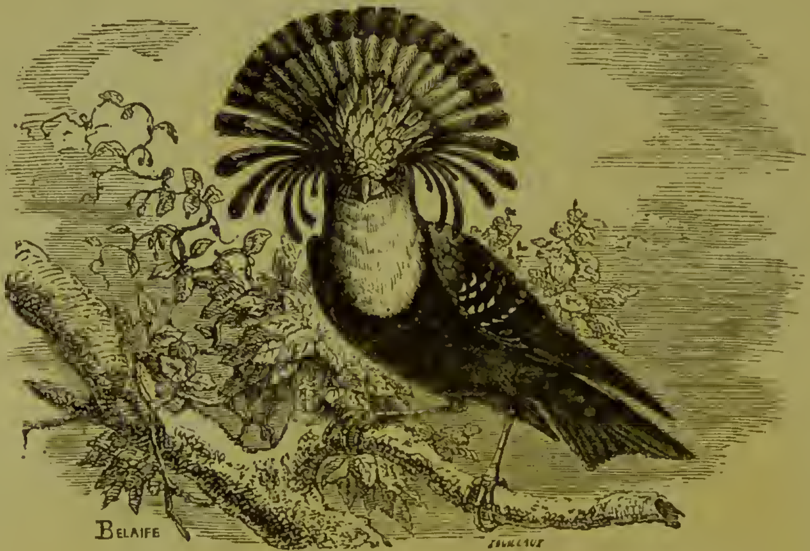
* Turdus sordidus: Latham. Ocypterus albovittatus: Cuvier, Gould. † Todidæ: Vigors. ‡ Todus viridis.

Another family of the tribe is formed of the Kingfishers, of which there are several genera. They are characterised by a straight, lengthened, and pointed beak, having an angular ridge and edges; by the extreme shortness of the tarsi, the outer and middle toes being united as far as the first joint; and by the short tail and rounded wings. They have generally a metallic surface, resplendent with brilliant hues. Tenanting the banks of secluded streams and rivers, they dart up and down the stream, or rest on some overhanging branch, watching for fish, at which they dart with arrow-like swiftness, and seize transversely with their sharp and powerful beak.



THE KING TODY.

THE COMMON KINGFISHER.[*]

A BIRD, of which so many marvellous stories have been told, from the notion of its being the Halcyon of the ancients, whose so-called nest, the *Halcyoneum*, was supposed to be endowed with medical properties, was likely to awaken superstitious regard in later times. Barrabas, in the "Jew of Malta," alluding to the practice of suspending it by a thread from the ceiling of the room, with doors and windows closed, that it might show the direction of the wind, says—

> "But now, how stands the wind?
> Into what corner peers my halcyon's bill?
> Ha! to the east? yes!"

Kent also, in "King Lear," when rebuking such "slaves" as the "steward," declares that they

> "Renege, affirm, and turn their halcyon beaks
> With every gale and vary of their masters."

Mrs. Charlotte Smith states that she once or twice saw a stuffed bird of this species hanging from the beam of a cottage-room as a weather-vane, to show the way of the wind; and similar facts are stated on various authorities.

The Kingfisher inhabits holes or burrows on the banks of streams, spending much time in the air near the water, or perched on the neighbouring bushes. It partly lives by fishing, but it catches also dragon-flies and other water insects, swallowing all its prey entire, and casting up, like owls, whatever is indigestible.

[*] Alcedo ispida.

Perched on some slender twig, overhanging the water, it might be mistaken for the gay flower of some beautiful water-plant, and so sure is it of instant escape, if desirable, that it will allow the observer a tolerably near approach, and, if it does not offer violence or make any noise—for the kingfisher specially loves silence—he may watch its movements on the surface of the brook.

But startle it, and few sights in some quiet spot are more pleasing than the first glance of this bird as it darts, in its rainbow hues, along some reach of a clear and placid stream, gliding between soft banks, richly fringed with reeds and bushes. Keen indeed must be the eye that follows it in its course; for rapidly will it fly, halt, and hover for a time, and then darting downwards, seize a little fish, a leech, or even a worm or a slug, and instantly bring it to land.

We have heard of "halcyon days," regarded ordinarily as seven days before and as many after the winter solstice, and we picture to ourselves those of brightness, and, when all invites to calm enjoyment, undisturbed by falling showers or even threatening clouds. But these are not among the choicest days of the beautiful kingfisher, halcyon as it is called. As it fishes entirely by sight, and its prey is often small, and it requires to see very clearly, its piscatory movements can continue only at particular spots and in peculiar states of the weather. But the water must be clear and the surface smooth, and that is why it is not found on turbulent or branching streams, or where the wind curls, the rain dimples, or the mud darkens the waters. As, however, on the days when evaporation has ceased, and there is an impending storm, the atmosphere is most transparent and the surface of the stream most glassy, these are the most fitted of all for the kingfisher's movements, and for the employment of that bill which is, in fact, a fishing spear, in the waters it frequents.

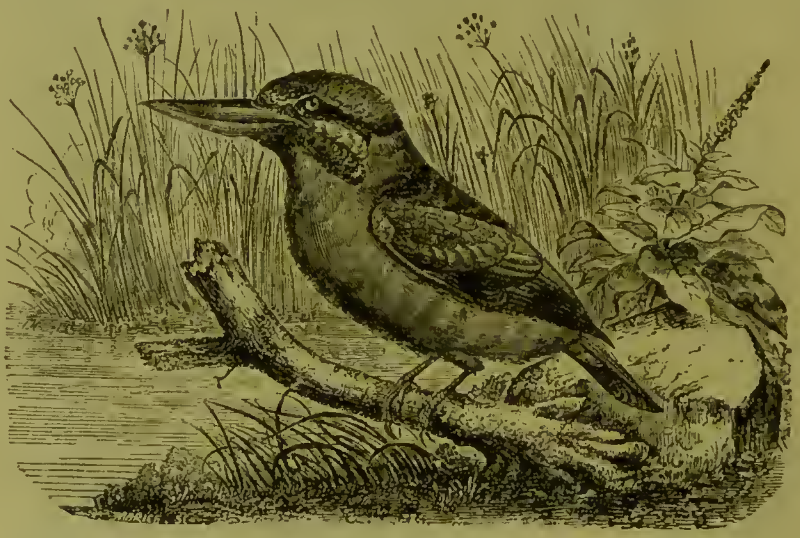
THE COMMON KINGFISHER.

Its nest, whether made for it or not, like that formed in banks by martins and other creatures, slopes downwards, and for this special reason, that, should it ever be accidentally filled with water, it may soon become dry again. There are about six eggs, and as the young are helpless until able to fly, they continue a considerable time in the nest, when, as their plumage has to grow, they are very clamorous for food. In due time they are able to fish for themselves. When winter drives their prey to deep and sheltered bottoms, the kingfishers leave the shallow inland streams and pass towards the coast, frequenting dykes and the mouths of rivers, especially on our southern coasts, and retire inland on the return of spring.

The species are very numerous, and are spread through every part of the world. They agree so closely, that to describe our native species will suffice for all. The crown of the head, cheeks, and wing-coverts are of a deep green, each feather being margined with a lighter metallic hue; the rest of the upper surface is of a brilliant azure, the ear-coverts rufous; the throat and back of the neck white; and the under surface fine rufous. The length of the bird is seven inches.

Another family* contains the Bee-eaters, a species which has the external toe nearly as long as the middle one, and both joined together up to the penultimate articulation.

The birds of this genus, like the swallow, take their prey on the wing; it consists of wasps, bees, &c., and, as Cuvier says, it is remarkable that the birds are not stung by them. They are distributed over the warmer regions of the old continent, Java, &c., and Australia, none of the genus having been found in America, where their place is supplied by the motmots. The prevalent hues of their plumes being azures and greens, remind us of the gorgeous dress of the kingfishers.



THE BLACK-HEADED KINGFISHER.

The Merops† of the Greeks, the *Merops Apiaster* of Linnæus, the *Guêpier Vulgaire* of the French, may be taken as an example. This bee-eater is frequent in the south of Europe in the summer; Sicily, Sardinia, Italy, the south of France, and Germany possess it, and in the southern border of Russia it is numerous. It is found in Turkey and in the Grecian Islands, and in autumn migrates towards Egypt. It breeds in holes in the banks of the Don and the Volga, laying from five to seven white eggs in a nest composed of moss and other materials. Hasselquist says that it is found in the plains of Galilee, and that it is called Varuar by the Arabs; and Temminck, that the individuals found at the Cape of Good Hope differ in nothing from those killed in Europe.

Ray observes: "It is not unfrequent in the Campagna of Rome; for that we saw it there to be sold in the market more than once. It is not found in England that we know of. Bellonius writes that it is so common in Candy as to be seen everywhere in that island. Aristotle tells us that it feeds upon bees, whom all other writers of the history of animals do therein follow. But it feeds not only upon bees, but also upon *Cicadæ*, beetles, and other insects; yea, as Bellonius relates, upon the seeds of the nipplewort, bastard parsley, turnip, &c., not abstaining from wheat and other grain. From its

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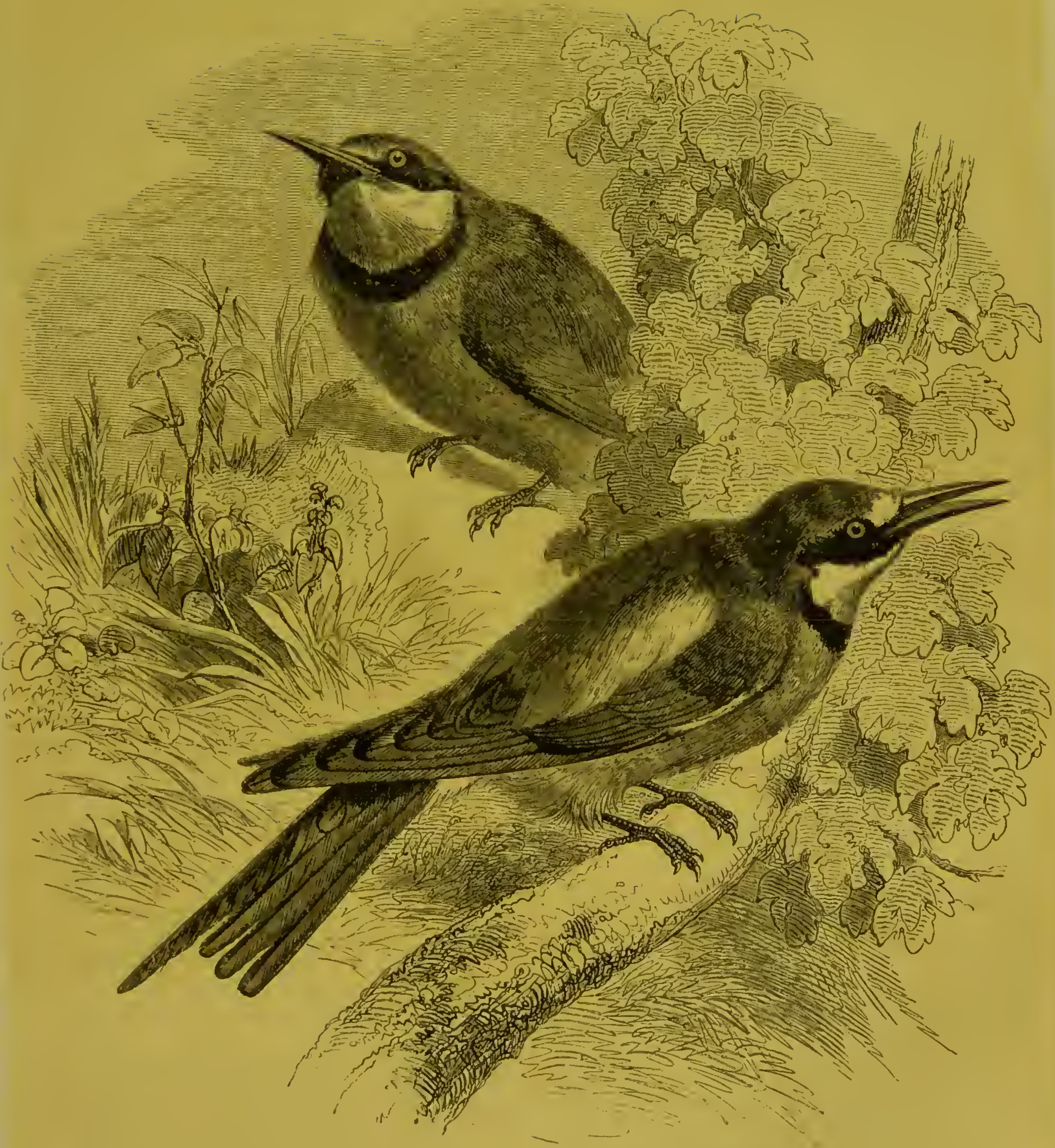
* Meropidæ.

† Μέροψ.



THE BEE-EATER.

exact agreement in the shape and make of its body, bill, and feet with the kingfisher, we suspect that it likewise preys upon fish."

These birds of the tribe through which we have now passed, depending so much on the power of their wings, exhibit a proportionate deficiency in the strength of their legs. These members are not only shorter and weaker than in the other perchers—certain families being excepted—but they have their external toes, in general, so united with the internal, for the most part as far as to the second phalanx, or joint, that they are deprived of its free play; and the bird is thus rendered nearly incapable of using its legs in walking, or for any purpose besides that of mere perching.

The second tribe* is distinguished, as the name indicates, by a notch, or slight tooth, on each side of the upper mandible of the bill, near its point. In some genera this tooth is scarcely perceptible, while, in others, it is well defined and tolerably strong, and, where it is so, the birds approach those of prey in spirit and in fierceness. The beak, also, varies in shape, strength, and size. In the shrikes it is strong and laterally compressed; in the fly-catchers, it is depressed, but the gradations are scarcely to be observed. Most of them are insect-eaters, but many add berries and fruits to their repast.

THE YELLOW SHRIKE.

One family† includes the Shrikes, or Butcher Birds. Alluding to their rapacious habits, Mr. Swainson observes, that the comparisons which have been drawn between them and the falcons are no less true in fact than beautiful in analogy, remarking that many of the *Falconidæ* sit on a tree for hours, watching for such little birds as come within reach of a sudden swoop, when these birds of prey pounce on the quarry, seize it in their talons, bear it to their roost, and devour it piecemeal. These, he says, are precisely the manners of the true shrikes; yet, with all this, the structure of the falcons and shrikes, and their more intimate relations, are so different, that they cannot be classed in the same order.

The short and strong bill is abruptly hooked at the end, and the notch is so deep as to form a small tooth, more or less prominent, on each side. This projection is analogous to the teeth of quadrupeds, so far as it enables the bird to take a firm grasp of its food, and is used to divide it into pieces; the claws, also, as instruments of capture, are peculiarly fine and sharp in the typical group, and this character pervades, more or less, the whole family. The mode of darting suddenly on their prey, rather than hunting or searching for it, is most prevalent in those groups which are nearest related to the fly-catchers, whose general weakness, however, confines their depredations to the smaller insects—larger and more powerful tribes being the food of the typical shrikes.

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* Dentirostres.

† Laniadæ.

THE GREAT SHRIKE.*

This bird is a native both of Europe and America, and is generally about ten inches in length. The upper parts of the plumage are of a pale ash-colour; and the wings and tail are black, varied with white. The throat, breast, and belly are of a dirty-white, and the legs are black. The female differs very little in appearance from the male.

The most remarkable part of the Great Shrike is the bill: it is black, and about an inch long; it is moved by very thick and strong muscles, and is an instrument peculiarly necessary to a species whose mode of killing, and also of devouring, its prey is so extraordinary. It preys chiefly on beetles, dragon-flies, and other large insects, and, as is also the case with others of this family, it impales them on thorns or sharp spikes, leaving them to be devoured at leisure; or, if hungry, immediately tearing them in pieces: hence they have received the name of Butcher Birds. In addition, however, to insects, the great shrike preys on frogs, mice, and small birds, which it does not strike like the hawk, but attacks with great ferocity, destroying them by piercing the brain, or by crushing in the skull with its strong bill, grasping them, at the same time, with its toes, which, though slender, are armed with sharp claws, and capable of being very firmly compressed. In spring and summer, it imitates the voices of other birds, by way of decoying them within its reach, that it may devour them; excepting this, its natural note is the same throughout all seasons.

THE RED-BACKED SHRIKE.

Mr. Bell, who travelled from Moscow, through Siberia, to Pekin, says that, in Russia, these birds are often kept tame in the houses. He had one given him, which he taught to perch on a sharpened stick, fixed in the wall of his apartment. Whenever a small bird was let loose in the room, the shrike would immediately fly from his perch, and seize it by the throat, so as almost instantly to suffocate it. He would then carry it to his perch, and spit it on the sharpened end, drawing it on carefully and forcibly with his bill and claws. If several birds were given him, he would treat them all, one after another, in the same manner. These were so fixed, that they hung by the neck until he was at leisure to devour them.

A gentleman in America, observing that several grasshoppers were stuck upon the sharp, thorny branches of the trees, inquired the cause, and was told they were thus spitted by the great shrike. On further inquiry, he was led to suppose that this was an instinctive stratagem adopted by the shrike, in order to decoy the smaller birds, which feed on insects, into a situation from whence he could dart and seize them. He is called, in America, "Nine-Killer," from the notion that he thus sticks up nine grasshoppers in succession. That the insects are placed there as a bait is said to appear from their being frequently left untouched for a considerable time. Wilson, however, calls this "a very pretty, fanciful theory," and maintains that the shrike can seize on small birds by mere force of flight. "I have seen him," he says, "in an open field, dart after one of our small sparrows with the rapidity of an arrow, and kill it almost instantly."

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* Lanius excubitor.

THE GREAT SHRIKE.

This bird frequents the deepest forests, builds a large and compact nest in the upright fork of a small tree, composed outwardly of dry grass and moss, and warmly lined with feathers. The female lays six eggs, of a pale cinereous colour, thickly marked at the greater end with rufous spots and streaks.

The second family is formed of the Fly-catchers.* Allied, in some degree, to the shrikes in habit, they differ in having the bill depressed horizontally, and garnished at its base with bristly hairs. The wings are more or less rounded. Some of the larger kinds surpass the shrikes in intrepidity, driving away birds larger and stronger than themselves; but they are less terrestrial in their habits, less inclined to move about among underwood and the foliage of bushes, and, also, are more rapid in their flight. The larger species add to their banquet small birds and quadrupeds; the smaller live exclusively on insects, which they take on the wing. They are mostly sedentary, and only dart on such insects as come within a sudden swoop, without attempting to pursue their game further; if unsuccessful in the first instance, they return, in fact, to the spot they left, or to another very near, and there wait patiently until another insect passes within the proper distance. This habit of feeding at once explains the reason of their feet being so small and weak, by showing that they are merely used to support the body; or, at least, that they are not employed in constant exercise or exertion, as in the generality of other birds.

THE BLACK SHRIKE.

THE PIED FLY-CATCHER.†

These birds are found farther to the north than the shrikes, chiefly beyond the heights on the confines of Stafford and Derby, where the principal locality of the latter terminates. They are traced thence along the hills between York and Lancashire, and so into the hilly parts of Westmoreland and Cumberland; but there is no account of them in Scotland, and they are very rare in those champaign parts of England over which they must pass to reach the interior and hilly districts.

The Pied Fly-catcher has a moulting in autumn and again in spring. The forehead of the male, a large band across each wing, occupying the secondaries, and the edge of the outer tail-feathers, on each side, are pure white; the rest of the upper surface is jet-black; the under surface is white. The female, as also the young, are destitute of white, and have the upper surface of an ashy-brown. In autumn the male assumes an attire like that of the female; but, in spring, he is seen in his characteristic plumage. The birds breed in holes, or in thick and close bushes, forming their nests of dry vegetables, and lining them with hair or feathers. The eggs seldom exceed five; they are of a pale greenish-blue.

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* Muscicapidæ.

† Muscicapa luctuosa.

In the morning, before the flies come out, the males are generally perched and singing; and, though their song has not much compass or variety, it is soft, and not without sweetness. For their peculiar habits they are constantly ready, so acute is their sight, so agile their motions; and, in the bright and sultry hours, they are continually hopping out and in the bushes, in chase of the flies. Well fitted as their wings are for the leaping flight, in which they catch their food, they are not so well adapted to long journeys, especially if they have to contend with gales of wind, blowing them to leeward in the pauses during which the strokes of their pinions are exhausted. Sometimes they are so exhausted as to be obliged to alight and rest, for a time, near the coasts, but they do not nestle there.

This species is very abundant in Central France, in Italy, and along the Mediterranean; and thousands are annually killed, in October, for the table, under the name of *Becafico* or *Becafigo*, which is derived from the root of *pica*, *peck*, *beck*, and *fico*, a fig; literally, a fig-peeker, as it feeds on figs and grapes. Under this term is also included a closely-allied species,* well known on the Continent as

THE COLLARED FLY-CATCHER.†

THIS bird is a native of the Cape of Good Hope. It is black and white beneath; the primary quills are white at the base; the tail and middle feathers are black, and the rest white. The male, in his summer plumage, has his neck arrayed in a white collar.

THE COLLARED FLY-CATCHER.

White tells us that the common fly-catcher is, of all our summer birds, the most mute and the most familiar; it also appears last of any. It builds in a vine or sweet-briar against the wall of a house, or in the hole of a wall, or on the end of a beam or plate, and often close to the post of a door, where people are going in and out all day long.

"The spotted fly-catcher,"‡ says Mr. Broderip, "can hardly be said to be a song-bird, for a chirping call-note forms its whole musical stock; but it is one of the most welcome and constant of our migratory birds; and the untiring zeal with which it clears the neighbourhood of small insects, such as gnats, makes it a cherished guest. Perched on the top of a stake or a post, or an upper gate-bar, or an outlying branch, the bird remains motionless, till some luckless insect, humming his lay as carelessly as his brother 'water-fly,' the dandy, hums the favourite air of the last new opera, comes within his range; off darts the fly-catcher, finishing the song and the life of the performer at the same instant, and returns to his station to repeat the exterminating process through the whole day. He is one of our latest visitors, seldom arriving till late in May; and his quiet hair-brown coat and his dull-white waistcoat, spotted and streaked with dark brown, are rarely seen till the oak-leaf has well burst the bud. As soon as the bird arrives, it sets about the work of incubation."

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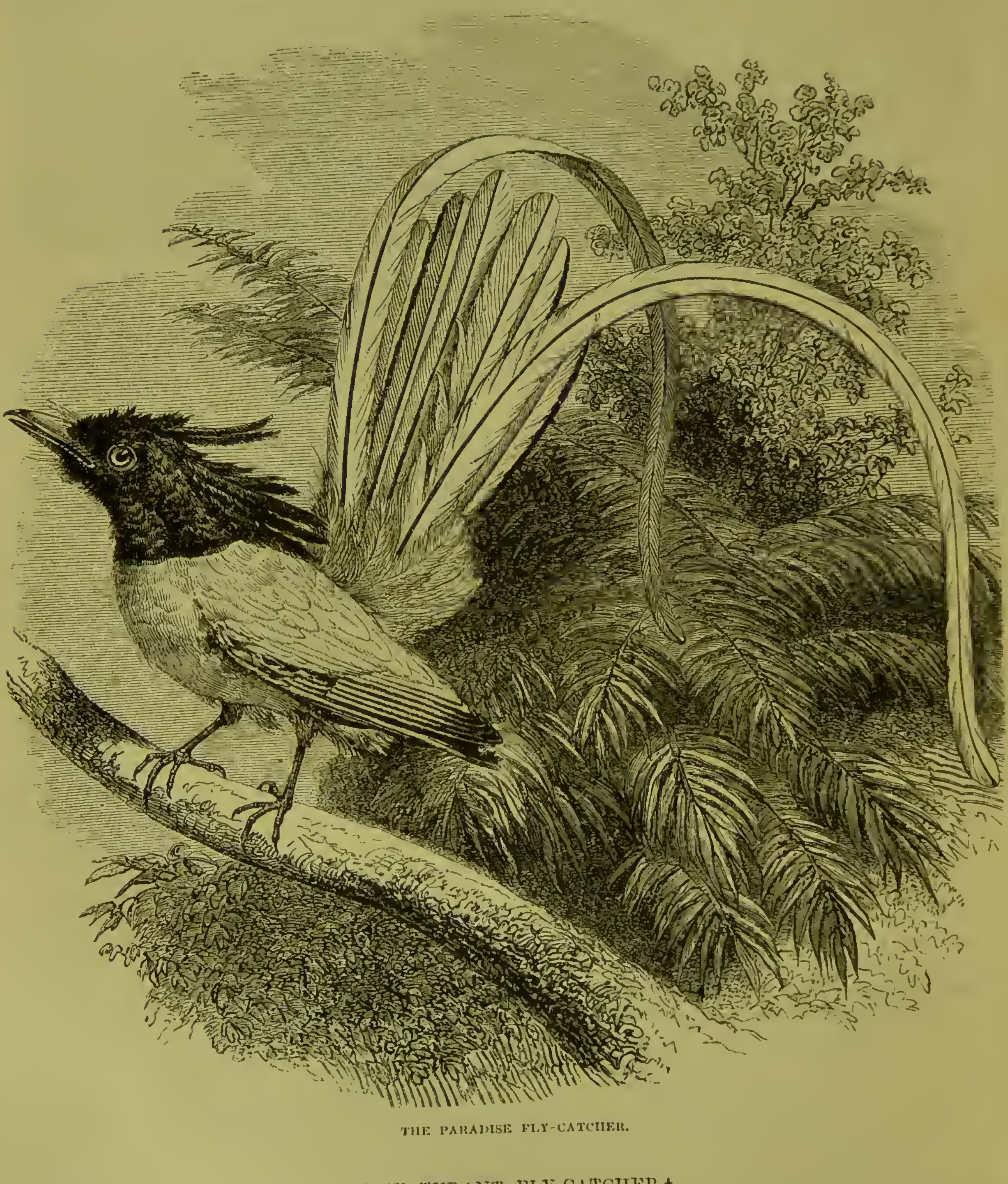
* Muscicapa albicollis. † Lanius collaris. ‡ Muscicapa grisola.

Of the Paradise Fly-catcher* there are several varieties, if not species. In some cases, the males are distinguished by the extraordinary elongation of the middle tail-feathers.



THE PARADISE FLY-CATCHER.

THE TYRANT FLY-CATCHER.†

This bird is one of the migratory visitors of the United States, and often bears the name of "King," as well as "Tyrant." According to Wilson, he does so from the extraordinary authority he assumes over all others during the time of breeding. So great is his affection for his mate, his young, and his nest, that, suspicious of every bird that approaches it, he violently attacks all intruders. In the month of May, June, and part of July, his life is one continued scene of broils and battles, in which, however, he generally comes off conqueror.

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* Muscicapa Paradisi.

† Muscicapa tyrannus: Brisson.

Strange to tell, hawks and crows, the bald eagle, and the great black eagle, all equally dread an encounter with him, who, as soon as he perceives any one of them approaching, launches into the air, mounts to a considerable height above him, darts down on his back, and sometimes fixes himself there, to the great annoyance of the assailed, who, if no convenient retreat or resting-place be near, strives, by various evolutions, to free himself from his merciless adversary. But the king bird is not easily dismounted. He teases the eagle incessantly, sweeps upon him from right to left, rises, that he may descend on his back with the greater violence, all the while keeping up a shrill and rapid twittering, and continuing the attack, sometimes for more than a mile, till he is relieved by some other of his tribe equally eager for the fray.

"There is one bird, however," says Wilson, "which, by its superior rapidity of flight, is sometimes more than a match for him; and I have several times witnessed his precipitate retreat before this active antagonist. This is the purple martin, one whose food and disposition are pretty similar to his own, but who has greatly the advantage of him on the wing, in eluding all his attacks, and teasing him as he pleases. I have also seen the red-headed woodpecker, while clinging on a rail of the fence, amuse himself with the violence of the king bird, and play 'bo-peep' with him round the rail, while the latter, highly irritated, made every attempt, as he swept from side to side, to strike him—but in vain. All this turbulence, however, subsides as soon as his young are able to shift for themselves; and he is then as mild and peaceable as any other bird."

One of his habits often proves fatal. He loves bees, and is often on the look out for these industrious insects. Planting himself on a post of the fence, or on a small tree in the garden, near the hives, he makes sad havoc among them as they pass and repass. But his shrill twitter, so near the house, tells the farmer what is going on, who, with his gun, brings to a close the career of the king bird for ever.

These birds have no power of song. They arrive in Pennsylvania about the 20th of April, sometimes in small bodies of five or six, and are at first very silent, until they begin to pair and build their nests. This generally occurs about the first week in May. The nest is frequently built on the horizontal branch of an apple-tree in the orchard, or on a sassafras-tree, at no great height from the ground. The outside consists of small, slender twigs, tops of withered flowers of the yarrow and others, well woven together with tow and wool. It is made large, and remarkably firm and compact: it is usually lined with fine, dry, fibrous grass and horse-hair. The eggs are five, of a very pale cream-colour, or dull-white, marked with a few large spots of deep-purple, and other smaller ones of light-brown. These birds generally build twice in the season.

The third family* consists of a great multitude of birds, about the true arrangement of which much is still undetermined. We shall be able, however, to select sufficient examples of their variety for our present purpose. To some of these we owe it, that

"Every copse
Deep tangled, tree irregular, and bush
Bending with dewy moisture o'er the heads
Of the coy quiristers that lodge within,
Are prodigal of harmony."

Cheering is the invitation:—

"Anna-Marie, love, up is the sun;
Anna-Marie, love, morn is begun;
Mists are dispersing, love, birds singing free;
Up in the morning, love, Anna-Marie."

And truly does Wordsworth say, as he thinks of clouds that have been gathering and obscuring the radiance of that orb:—

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* Sylviadæ.

> "Glad moment is it when the throng
> Of warblers, in full concert strong,
> Strive—and not vainly strive—to rout
> The lagging shower, and force coy Phœbus out;
> Met by the rainbow's form divine,
> Issuing from her cloudy shrine."

In this family it will be well to notice several genera. One genus,* according to the eminent ornithologist, Mr. Yarrell, has the following characters:—The beak is straight and slender, with a few stiff hairs at the base; the nostrils basal, lateral, oval, half-closed by a membrane; the first quill-feather of the wing about half as long as the second, the second shorter than the third or fourth, which are the longest in the wing. As to the feet, the tarsus is rather long; there are three toes in front, and one behind the outer toe connected by a membrane with the middle toe; the claw of the hind toe short, strong, and curved.

THE STONE-CHAT.†

THIS bird has a very extensive and varied range, being found in France, Germany, Russia, Provence, Italy, Smyrna, Japan, the Deccan, the banks of the Ganges, the mountain-chain of Upper Hindustan, Senegal, and South Africa, as well as England, Ireland, and Scotland; hence it bears a variety of names.

THE STONE-CHAT.

Dressed in its summer plumage, the male has the head, throat, back, and small coverts of the wings black, but each feather is finely bordered with ruddy brown; a great white spot on the sides of the neck, on the upper part of the wings, and on the rump. The breast is deep ruddy, the lower parts very bright ruddy; the wings brown, bordered with brighter brown; the base of all the tail-feathers white, the rest of a blackish brown. The female has the white spaces less extended, and the ruddy colour less vivid.

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* Saxicola.

† Saxicola rubicola.

These birds seldom appear on our heaths and commons, dappled with furze and bushes, before the end of March, but when its winds blow roughly, they quit the open spots for a shelter in the snug lanes and groves. As the season becomes genial they return, and the black, white, and brown of the stone-chat contrasts beautifully with the green and gold of the furze, as he sits on the topmost branch and takes his pleasure; springing a few feet into the air, hovering over the bushes or the stones, darting hither and thither, like a dragon-fly over the margin of a brook, in chase of insects, and chanting his little song, which, though low, is sweet and cheering to his mate, nestling in her little bower.

That bower is either on the ground or some dwarf bush. Outwardly it is a fabric of moss and grass; and within there is a lining of a few fine bents, hairs, and feathers. The eggs are pale-blue, with somewhat of a grayish tint, finely dotted with obscure reddish-brown at the large end.

THE WHIN-CHAT.*

This is one of our feathered visitors in summer; it is also found in Norway, Sweden, temperate Russia, and all southern Europe to the Mediterranean; and in winter it is common in Smyrna.

THE WHIN-CHAT.

The upper surface of the Whin-chat is of a yellowish brown, with a central dash of brownish-black, and a large spot of white in the centre of each wing. A broad streak of white passes above the eyes, while the cheeks and ear-coverts are black; the throat, the sides of the neck, and the basal half of all the tail-feathers, except the two middle ones, are also white; the rest of the tail is black; the chest is of a fine light rufous. The female is inferior in appearance to the male; having no black on the cheeks or white on the wing, the white streak over the eye is smaller, and the general colours of the plumage are less pure and distinct.

The flight of the Whin-chat is undulating; furze commons are its favourite haunts; there it may be seen flitting from bush to bush, and perching on one of the topmost twigs. The ear, too, catches its well known cry of *u-tick, u-tick,* which it sends forth from the bushes and hedgerows it frequents, with a singular jerk of the tail, repeating the last syllable two or three times in succession, and the next moment flitting to a distant spray and reiterating its curious cry as before. It may be, however, its expression of fear or distress.

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* *Saxicola rubetra.*

Its nest is made of dry grass and vegetable fibres, and is placed in a bank among the roots of tangled shrubs, or at the foot of some thick bush, where it can hide successfully. The Whin-chat is peculiarly attentive to its mate in the nest. Its song is very pleasing, and resembles that of the goldfinch, and not only will it sing during the day, but in the evening, and sometimes at night.

THE WHEATEAR.*

So wide is the geographical distribution of this bird, that it includes Lapland, Denmark, Sweden, Norway, Iceland, and the Faroe Islands. In Europe it is abundant, particularly on the northern shores of the Mediterranean. It is found in Dalmatia and the Morea. It was noticed at Smyrna by Mr. Strickland, and procured by Mr. Keith Abbott at Trebizond.

The upper parts of the body of the male are a sky-gray; the forehead, the band above the eyes and throat are white; black passes from the root of the bill below the eye, and covers the orifice of the ears; the wings are black; the rump and tail are white, for two-thirds of the length of the latter; the rest, towards the end, black, excepting the two middle feathers, which are entirely black; the front of the neck and breast are of buff-colour, the rest of the lower parts buffy white.

The upper parts of the female are ashy-brown; the forehead rusty-gray; deep brown is above the eye, and covers the orifice of the ears; the wings are blackish brown, bordered with bright brown; the white at the origin of the tail less extended, the neck and breast ruddy, the rest ruddy white.

The Wheatear generally sits on the watch, upon an elevated clod or stone, for insects, which in great numbers it captures on the wing. Its flight is low, but smooth and rapid. Its song, though heard with difficulty in the open air, is soft and sweet; it is often poured forth, as the male hovers over his mate, expanding the feathers of his tail.

They construct their nest of dried roots and feathers, as well as other materials, and deposit it in a place where it cannot easily be detected. It is stated that, in Norfolk or Suffolk, a deserted rabbit-burrow is usually chosen, and the nest is placed near the entrance. Mr. Salmon says, in such situations it is sure to be discovered by the accumulation of a number of small pieces of the *Pteris aquilina*, which the old birds amass outside the entrance. Mr. Yarrell found a nest in a fallow field, under a large clod, to which his attention was drawn by a portion of its materials appearing outside the hole, through which the bird passed to the hollow space within.

In the north the wheatear is generally found on heaps of stones, and in the early season it sings sweetly. Its common alarm note is not unlike the sound made by breaking stones with a hammer, and often it utters it from the top of the heap, beneath which its nest is often found.

About the middle of September these birds visit the downs of Kent and Sussex in great numbers, which seem daily to increase. At this season they are caught in snares and in traps for the table, being highly esteemed as delicacies. A shepherd has been known to take eighty-four dozens in a single day. About Eastbourne they especially abound, and are taken, Latham states, to the number of more than one thousand eight hundred dozens annually, in snares of horse-hair. In a visit to the Isle of Portland, where the people do all that is practicable with the produce of the quarries—piling up stones, for instance, to serve instead of a gate, and pulling them down when it is wanted to pass out or in—the writer saw traps of stone, somewhat resembling oyster-shell grottoes, placed on numerous spots, for the wheatear.

THE REDBREAST.†

This bird, with its "scarlet stomacher," is too well known to require any particular description. The female has the breast of a dull yellowish brown; while the young ones are of a dull yellowish green, without the orange red on the breast.

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* Saxicola œnanthe:

† Sylvia rubicola.

In the bright days of summer the robin is shy and unobtrusive, it is therefore but little noticed, and its song is lost in the strains of that season. At first it is busy in preparing its nest, which is placed on the ground, at the roots of trees, and in other retired spots. Should the foliage here not afford a natural concealment, the birds form an artificial one of dry leaves, so that they may reach the nest without disclosing its site. The strewing of leaves on "the Babes of the Wood" was, doubtless, suggested to the minstrel by the female covering her eggs when she has to leave them. Like wrens, the redbreasts often nestle near houses, but so cautious are they in leaving and returning home, that the nests are seldom seen. The eggs are yellowish gray, mottled with chestnut colour, and rarely exceed seven in number.

In due time the young have to be reared, and the robin provides for them and its mate with exemplary activity. It is probable that the common house-fly is the first prey to engage its attention, though it will pick up grain, crumbs, and anything else that is eatable. But myriads of insects are captured by these birds where they alight to deposit their eggs on the embryo buds; the robins continue the chase as long as a fly can be found, and then the next spoil is the eggs.

On the coming of autumn the robin loses the shyness of earlier months; he now traverses the grass-plat in search of insects, hops complacently up and down the gravelled walks of the garden, and leaves an unfortunate worm, only intent on looking out of its aperture in the soil, no chance of escape. As the season advances, the words of Thomson are verified:

"The redbreast, sacred to the household gods,
Wisely regardful of the embroiling sky,
In joyless fields and thorny thickets leaves
His shivering mates, and pays to trusty man
His annual visit. Half-afraid, he first
Against the window beats; then brisk alights
On the warm hearth; then hopping o'er the floor
Eyes all the family askance,
And pecks, and starts, and wonders where he is;
Till more familiar grown, the table crumbs
Attract his slender feet."

The writer has accounted it a special rural pleasure to make the acquaintance of many a robin: watching him in his garden, as if the sagacious bird knew that worms were being turned up and he might have an easy banquet; perching on the neighbouring wall, when the fowls and the pigeons were fed, that he might alight and share in the regale; or gathering gaily the crumbs placed for him, as he seemed well to know, on the window-sill. And no wonder the robin is a general favourite: his personal beauty, his sprightly movements, his cheerful carol, his near approach to observe anything man is doing, and the special familiarity he may at length attain, all unite to render him engaging. Dr. Jenner only expressed the feelings of thousands as he said:—

"Come, sweetest of the feather'd throng!
And soothe me with thy plaintive song:
Come to my cot, devoid of fear,
No danger shall await thee here:
No prowling cat, with whiskered face,
Approaches this sequestered place:
No schoolboy with his willow-bow
Shall aim at thee a murderous blow:
No wily lim'd twig ere molest
Thy olive wing or crimson breast:
Thy cup, sweet bird, I'll daily fill
At yonder cressy, bubbling rill,
Thy board shall plenteously be spread
With crumblets of the nicest bread;
And when rude winter comes and shows
His icicles and shivering snows,
Hop o'er my cheering hearth and be
One of my peaceful family:
Then soothe me with thy plaintive song,
Thou sweetest of the feathered throng!"

THE NIGHTINGALE.*

THE name of this bird is derived from the Saxon—night, and *galan*, to sing; or, the night-singer. Antony calls Cleopatra his "nightingale," and says:—

"The nightingale, if she should sing by day,
When every goose is cackling, would be thought
No better a musician than the wren."

This charming bird may be traced from England, through Germany, Poland, France, Italy, and Palestine.

It is the largest of all the warblers, being about seven inches in length, and between ten and eleven in the extent of its wings. The upper parts are of a deep yellowish brown, inclining to reddish brown; the quills and greater coverts are dusky brown, with reddish brown margins; the tail deep reddish brown, and very slightly forked; the sides of the neck, ear-coverts, breast and flanks, pale ash-gray, passing into grayish white on the throat and lower parts; an obscure dusky streak going from the gape down the side of the neck, and into the gray of the breast. The colours of the female are like those of the male. The bill is wood brown, with the basal end of the lower mandible pale yellowish brown; the tarsi, which are long, and the toes, are of the same colour.

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* Curruca luscinia.

Though this warbler is plentiful in some localities, it is never found in others. The writer has frequently heard the nightingale in different places in the neighbourhood of London; and in its finest voice in the Isle of Wight, near St. Lawrence. It is found in Sussex, Dorsetshire, Somersetshire, and the eastern part of Devonshire, but not in Cornwall. It frequents a great part of Yorkshire, but it is unknown in Lancashire, though it has been heard in Carlisle. *Eos* is its Welsh name, but Wales is not known to possess it. Leyden asks—

"Sweet bird! how long shall Teviot's maids deplore
Thy song unheard along her woodland shore?"

and the same lament may arise for the daughters of Erin. Sir J. Sinclair endeavoured to introduce this delightful songster into the groves of Scotland, exchanging the eggs of robins for those of nightingales. The young birds were hatched and brought up by their foster parents; they migrated in September, their usual time, but never returned to the place of their birth. A similar experiment was made at Swansea, with the same result.

The males first venture across the channel, disperse themselves over the country, resort to thick hedges, copses, and plantations, pour forth their songs at eve, and await the arrival of their mates, which is sometimes delayed beyond a few days, by cold and ungenial weather. Most artfully contrived and carefully concealed are the nests they build. Composed externally of dried leaves or grass, or of the skeleton leaves which strew the banks and thick bottoms of hedges, the little dwelling is lined with hair and soft fibres. Calculated to deceive the eye, it is placed low down in a thick bush or luxuriant hedge, among intertangled stems. The eggs, of a greenish brown, are five in number.

"Can there be a man," says Belon, an old French writer, "so deprived of judgment as not to take admiration in hearing such melody come out of the throat of a little bird?" Crashaw has the same idea in his "Music Duel," where he describes the nightingale as trailing,

"Through the sleek passage of her open throat,
A clear unwrinkled song: then doth she point it
By short diminutions,
That from so small a channel should be raised
The torrent of a voice, whose melody
Could melt into such sweet variety."

Hurdis says:—

"Now I steal along a woody lane,
To hear thy song so various, gentle bird,
Sweet queen of night, transporting Philomel.
I name thee not to give my feeble line
A grace else wanted, for I love thy song,
And often have I stood to hear it sung,
When the clear moon, with Cytherean smile
Emerging from an eastern cloud, has shot
A look of pure benevolence and joy
Into the heart of night. Yes, I have stood
And marked thy varied note, and frequent pause,
Thy brisk and melancholy mood, with soul
Sincerely pleased. And oh, methought no note
Can equal thine, sweet bird, of all that sing
How easily the chief! Yet have I heard
What pleases me still more—the human voice
In serious sweetness flowing from the heart
Of unaffected woman. I could hark
Till the round world dissolved to the pure strain
Love teaches, gentle modesty inspires."

"The nightingale," it has been truly said, "passes from grave to gay; from a simple song to a warble the most varied; and from the softest trillings and swells to languishing and lamentable sighs, which he as quickly abandons to return to his natural sprightliness."

Milton has said—

"Sweet bird! that shunn'st the noise of folly,
Most musical, most melancholy;
Thee, chantress, oft the woods among
I woo, to hear thy evening song."

To this Coleridge replies:

"And, hark! the nightingale begins its song,
'Most musical, most melancholy' bird.
A melancholy bird? oh! idle thought!
In nature there is nothing melancholy.
——'Tis the merry nightingale
That crowds, and hurries, and precipitates
With fast, thick warble, his delicious notes,
As he were fearful that an April night
Would be too short for him to utter forth
His love-chant, and disburden his full soul
Of all its music!

"And I know a grove
Of large extent, hard by a castle huge,
Which the great lord inhabits not; and so
This grove is wild with tangling underwood,
And the trim walks are broken up, and grass,
Thin grass and kingcups, grow within the paths;
But never, elsewhere, in one place I knew
So many nightingales; and far and near,
In wood and thicket, over the wide grove,
They answer and provoke each other's song
With skirmishes and capricious passagings,
And murmurs musical and swift, jug, jug,
And one low piping sound more sweet than all—
Stirring the air with such an harmony,
That should you close your eyes, you might almost
Forget it was not day! On moonlit bushes,
Whose dewy leaflets are but half disclosed,
You may perchance behold them on the twigs,
Their bright, bright eyes, their eyes both bright
and full,
Glistening, while many a glow-worm in the shade
Lights up her love-torch.

"And oft a moment's space,
What time the moon was lost behind a cloud,
Hath heard a pause of silence; till the moon
Emerging, hath awakened earth and sky
With one sensation, and these wakeful birds
Have all burst forth in choral minstrelsy,
As if some sudden gale had swept at once
A hundred airy harps!"

No wonder that our rustic poet Clare remarks:

"I've often tried, when tending sheep or cow,
With bits of grass and peels of oaten straw,
To whistle like the birds. The thrush would start
To hear her song of praise and fly away;
The blackbird never cared, but sang again;
The nightingale's pure song I could not try,
And when the thrush would mock her song, she paused,
And sang another song no bird could do.
She sang when all were done, and beat them all."

According to Bechstein, "The first good quality of a nightingale is undoubtedly its fine voice." He then states that this bird expresses his different emotions by suitable cries and particular intonations. The most unmeaning cry when he is alone appears to be the simple whistle, "fitt;" but if the syllable "err" be added, it is then the call of the male to the female. The sign of displeasure, or fear, is "fitt," repeated rapidly and loudly before adding the terminating "err;" while that of satisfaction, pleasure, and complacency is a deep "tack," which may be imitated by smacking the tongue. In anger, jealousy, rivalry, or any extraordinary event, he utters hoarse, disagreeable sounds, somewhat like a jay, or a cat. Lastly, in the season of pairing, during their playful gambols, a gentle, subdued warbling is all that is heard.

"Nature," he continues, "has granted these tones to both sexes; but the male is endowed with so very striking a musical talent, that, in this respect, he surpasses all birds, and has acquired the name of the king of songsters. The strength of his vocal organ is, indeed, wonderful; and it has been found that the muscles of his larynx are (proportionately) much more powerful than those of any other bird. But it is less the strength than the compass, flexibility, prodigious variety, and harmony of his voice, which make it so admired by all lovers of the beautiful. Sometimes dwelling for minutes on a strain composed of only two or three melancholy tones, he begins in an under voice, and swelling it gradually by the most superb *crescendo* to the highest point of strength, he ends it by a dying cadence; or, it consists of a rapid succession of more brilliant sounds, terminated, like many other strains of his song, by some detached ascending notes. Twenty-four different strains or couplets may be reckoned in the song of a fine nightingale, without including its delicate little variations; for among these, as among other musicians, there are some great performers and many middling ones. This song is so articulate that it may be very well written.

"The nightingales of all countries, the south as well as the north, appear to sing in the same manner; but there is, as has been observed, so great a difference, that we cannot help acknowledging that one has a great superiority over another. On points of beauty, however, where the senses are the judges, each has his own peculiar taste. If one nightingale has the talent of dwelling agreeably on his notes, another utters his with peculiar brilliancy; a third lengthens out his strain in a peculiar manner; and a fourth excels in the silveriness of his voice. All four may excel in their style, and each will find his admirer; and it is very difficult to decide which merits the palm of victory. There are, however, individuals so very superior as to unite all the beauties of power and melody; these are generally birds which, having been hatched with the necessary qualifications, in a district well supplied with nightingales, appropriate whatever is most striking in the song of each. As the return of the males in spring always precedes that of the females by seven or eight days, they sing before and after midnight, in order to attract their companions on their journey during the fine nights. If their aims succeed, they then keep silence during the night, and salute the dawn with their first accents, which are continued through the day. Some persist, in their first season, in singing before and after midnight; whence they have obtained the name of nocturnal nightingales. After repeated experiments for many successive years, I think I am authorised in affirming that the nocturnal and diurnal nightingales form distinct varieties which propagate regularly; for if a young bird be taken out of the nest of a night-singer, he will in turn sing at the same hours as his father, not the first year, but certainly in the following; while, on the other hand, the young of a day-nightingale will never sing in the night, even when it is surrounded by nocturnal nightingales. I have also remarked that the night-singers prefer mountainous countries, and even mountains themselves, whilst the others prefer plains, valleys, and the neighbourhood of water. I will also venture to affirm that all the night-singers found in the plains have strayed from the mountains. Thus, in my neighbourhood (Walterhausen, Saxony), inclosed in the first chains of the mountains of Thuringia, we hear only night-singers; on the plains of Gotha they know only the day-nightingale."

THE NIGHTINGALE.

Isaac Walton observes of this noted song-bird: "He that, at midnight, when the very labourers sleep securely, should hear, as I have heard, the clear air, the sweet descants, the natural rising and falling, the doubling and redoubling, of her voice, might well be lifted above the earth, and say, Lord! what music hast thou provided for thy saints in heaven, when thou affordest bad men such music on earth?"

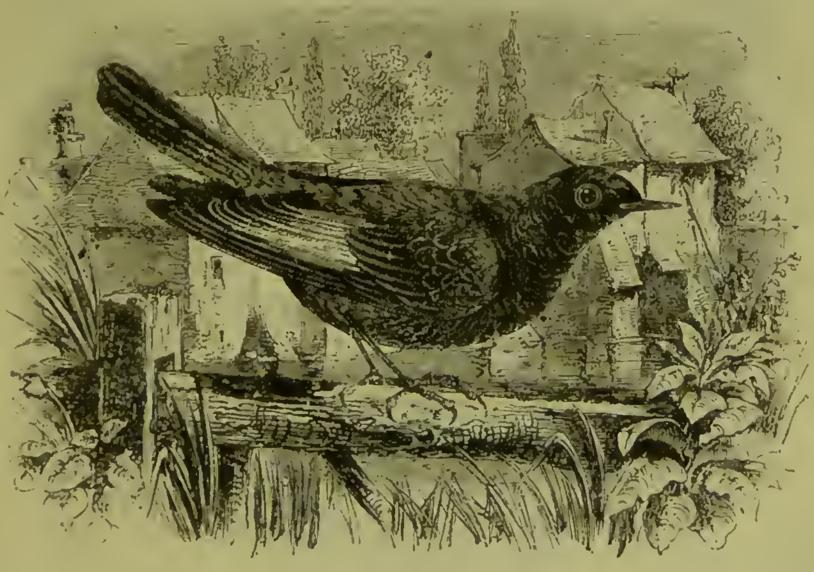
Dr. Latham states that, "as is usual with the migrating warblers, the male bird remains on the spot to which it first resorts, attracting the female by its song; and if by accident the female is killed, the male, which had become silent, resumes his song, and will continue to sing late in the summer, till he finds another mate, in which case they will breed at a later season."

The nightingale is capable of forming attachments to individuals. When once the bird has become acquainted with the person who takes care of it, it distinguishes his step before it comes within sight, welcomes him with a cry of joy, and during the moulting season, makes efforts, though vainly, to sing, and shows its emotions in the gaiety of his movements, and the expression of its looks, when it cannot give them a vocal utterance. Should it lose its benefactor, it has been known to pine to death; and should it survive, it is long before it becomes accustomed to another. Its attachments are long, because they are not hasty, which is the case with all mild and timid dispositions.

A white nightingale, valued at six thousand sesterces, was once presented by the Empress Agrippina to one of her friends. Pliny tells that some nightingales belonging to the two sons of the Emperor Claudius spoke Greek and Latin, and made new phrases every day to divert their masters. Gesner describes two others, belonging to an innkeeper at Ratisbon, which—more wonderful still—conversed all night on the politics of Europe; but he adds, they did no more—enough certainly—than repeat at night the conversation they had heard during the day.

THE REDSTART.*

Copses, the borders of woods, orchards, and gardens, where insect food is abundant, are frequented by this visitor of ours during the spring and summer. It is very quick and animated in its movements, often catching its prey very skilfully on the wing. On the ground, it trips along lightly and quickly, accompanying every action with a singular vibrating motion of the tail, which, in the male, is of a bright flame colour, in striking contrast with the rest of his plumage.



THE BLACK REDSTART (FORMERLY CALLED THE RED TAIL).

The nest is rather loosely constructed; it is formed of moss and stalks of grass, and lined with feathers. The eggs, five or six in number, are of a fine greenish blue. Various are the places chosen for the nest. For two years in succession, a pair built in an ornamental vase in a garden; but holes in garden walls, ledges in out-buildings, bowers of ivy, and similar sites, are commonly selected.

The redstart is, in form and colour, a very elegant bird; its upper surface being of a fine bluish gray. The general plumage of the female is one uniform grayish brown. The song is low, soft, and sweet, and generally uttered while the bird is perched on the topmost branch of a low tree. It imitates the notes of other species, and often, with excellent effect, mingles their strains with its own.

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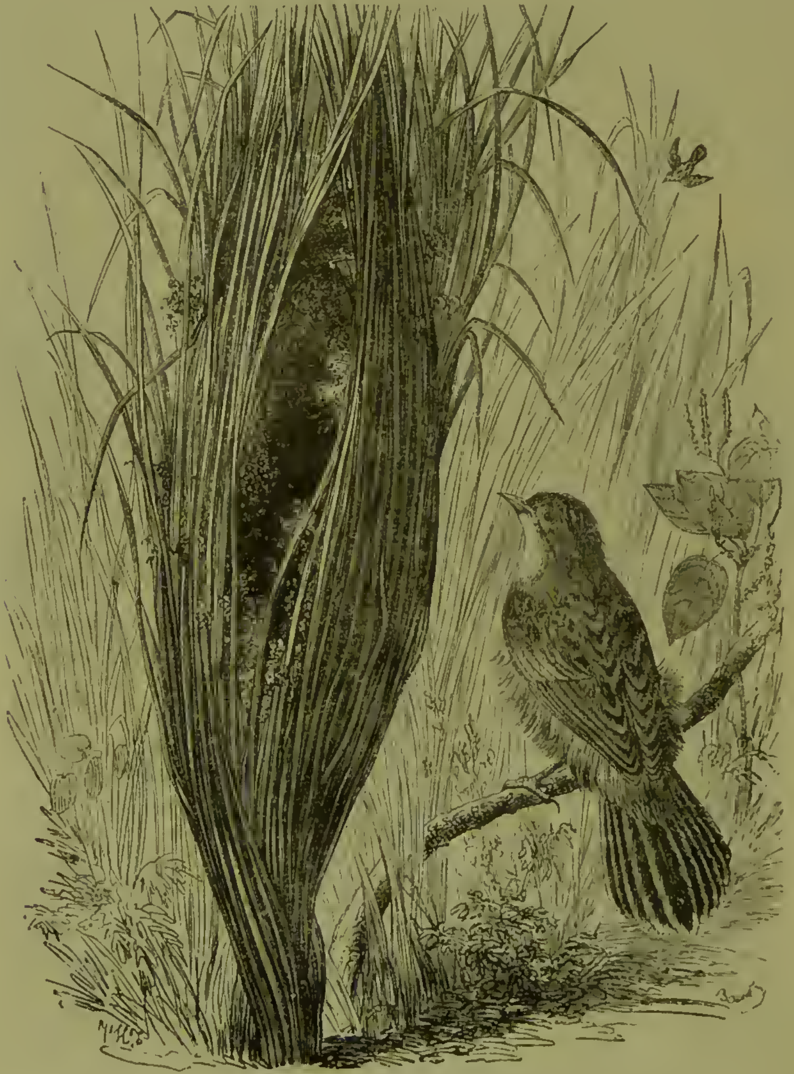
* Phœnicura tythis.

This species is very extensively diffused on the Continent. It is abundant in France, Italy, and Spain; it also visits Germany, and extends its migration to Russia, Sweden, and Norway. The Black Redstart,* an allied species, is common in the temperate parts of Europe and Asia, but only occasionally visits our island.

THE FAN-TAIL WARBLER †

The plumage of this interesting little bird is of a dead leaf colour, or reddish-yellow above each feather, having a sprinkling in the middle of longitudinal spots, except on the lower portion of the back, which is plain, as is also the whole of the under surface, which is of a reddish white. The tail is short, graduated, and of a blackish brown, each feather having a deep black spot near the end. The Fantail Warbler is peculiar to the southern provinces of Europe, as Spain, Portugal, Sicily, and Italy.



THE FAN-TAIL WARBLER.

Truly amazing is the structure of its nest; it is placed in a tuft of tall grass, and raised from the ground. Of the grass many blades are very nicely drawn together, or rather sewn with a kind of cotton thread, which the bird manufactures. The blades of grass, thus secured, form an outer case and support to a long barrel-shaped nest, which is open at the top, and closely concealed from view. What a wonderful display of instinct is there in this beautiful structure; the choice of a place where it may be reared, the thread by which the materials may be made fast, and then the interlacing, or sewing them together! Who but God could be the teacher of this little bird, and, indeed, of every other?

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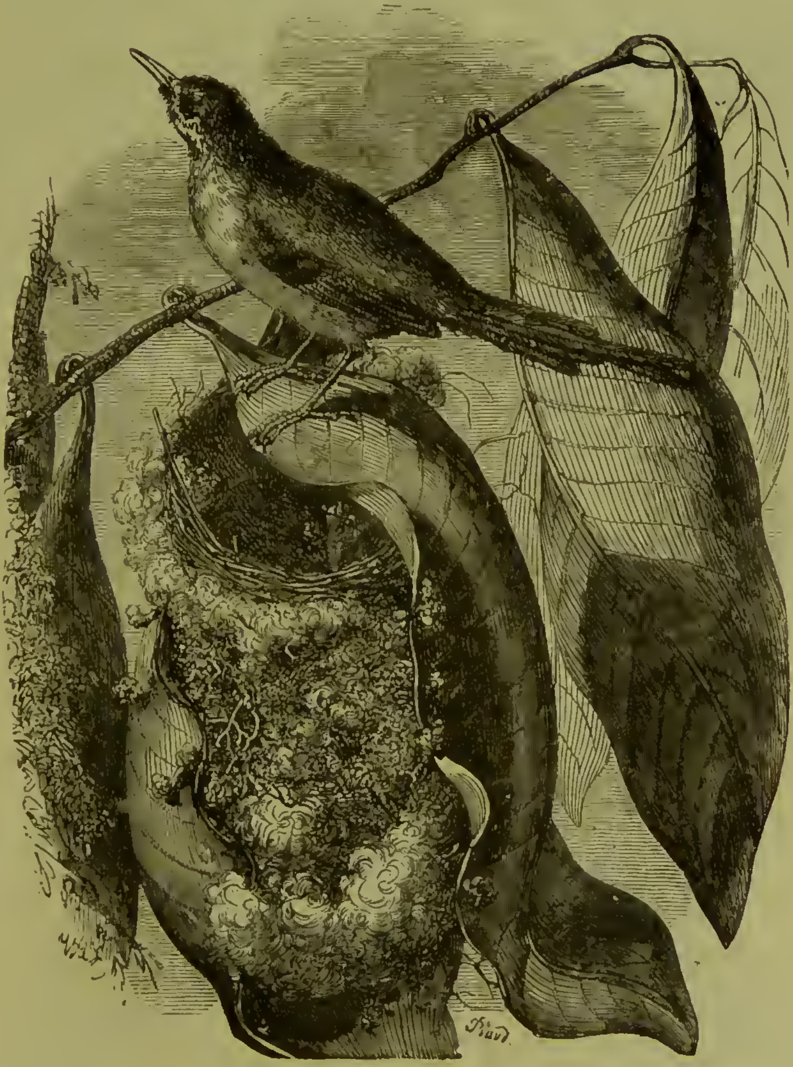
* Phœnicura tithys.

† Sylvia cisticola.

THE TAILOR BIRD.*

Dr. Darwin appears to have been the first of our countrymen to remark, "The tailor bird will not trust its nest to the extremity of a tender twig, but makes one more advance to safety by fixing it to the leaf itself. It picks up a dead leaf, and sews it to the side of a living one, its slender bill being its needle, and its thread some fine fibres; the lining consists of feathers, gossamer, and down; its eggs are white; the colour of the bird light yellow; its length three inches; its weight three-sixteenths of an ounce; so that the materials of the nest are not likely to draw down a habitation so slightly suspended. A nest of this bird is preserved in the British Museum."



NEST OF THE TAILOR BIRD.

Others have since been added to that most interesting and valuable collection. But Forbes, who observed the bird in India, says nothing of the "dead leaf." Having referred to the baya, he says, "Equally curious in the structure of its nest, and far superior in the variety and elegance of its plumage, is the tailor-bird of Hindostan, so called from its instinctive ingenuity in forming its nest; it first selects a plant with large leaves, and then gathers cotton from the shrub, spins it to a thread by means of its long bill and slender feet, and then, as with a needle, sews the leaves neatly together to conceal its nest. The tailor-bird resembles some of the humming-birds at the Brazil, in shape and colour; the hen is clothed in brown; but the plumage of the cock displays the varied tints of azure, purple, green, and gold, so common in those American birds. Often have I watched the progress of an industrious pair of tailor-birds, in my garden, from their first choice of a plant, until the completion of the nest, and the full growth of the young. How applicable are the following lines, in the 'Musæ Seatonianæ,' to the nidification of the tailor-birds, and the pensile nests of the baya :—

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* Sylvia sutoria.

> 'Behold a bird's nest!
> Mark it well, within, without!
> No tool had he that wrought; no knife to cut,
> No nail to fix, no bodkin to insert,
> No glue to join; his little beak was all:
> And yet how neatly finished! What nice hand,
> With every implement and means of art,
> Could compass such another?'"

THE HEDGE-SPARROW.*

THE nest of this well-known bird abounds in the hedges of our fields and gardens. Its eggs are of a beautiful azure blue. In summer the hedge-sparrow feeds eagerly on caterpillars, and hence checks the number of perfect insects, and unlike most of the warblers, this little bird braves our wintry rigours, finds caterpillars hidden in the bark of trees, and adds to its meal berries and seeds.

A nestling nightingale learnt the notes of a hedge-sparrow that sang near to it, for want of other sounds to imitate; and it was extraordinary to hear the gentle, although agreeable warble of the latter attuned to the full compass and power of the nightingale. The effect was most pleasing, although, of course, not equal to the natural notes of this bird, not one of which he retained. Indeed, many birds are almost entirely imitative, and in default of hearing the parent bird, they borrow notes of others: soft-billed birds always preferring the song of soft-billed birds, and *vice versa*.

THE GRASSHOPPER WARBLER.†

THIS bird is by no means common, and appears to be local in its distribution. Its favourite haunts are low, damp places, overgrown with furze, bramble, and underwood; and in the very densest parts of it it remains shrouded from observation.

THE GRASSHOPPER WARBLER.

According to Mr. Selby, who could tell by its sounds that it was near, but who had to wait long before he could see it, its note consists of a sibiline ringing cry, repeated for many minutes without intermission, and resembles so exactly the note of the mole-cricket as to render it a difficult task to distinguish between the two. In the utterance of this note, it seems to possess a kind of ventriloquism, as it can cause the sound at one moment to proceed from the immediate neighbourhood of the listener, and at the next, to sound as if removed to some distance, without any actual change of place in the bird.

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* Accentor modularis.

† Salicaria locustella.

The grasshopper-warbler builds its nest, which is thick and compact, of moss and the stems of grass, in the most dense and secluded spot of the thicket. The male and female are alike in colouring. The eggs are of a pinkish gray, speckled with a deeper tint.

THE REED-WREN OR REED-WARBLER.*

The nest of this bird is a very beautiful structure; it is of an elongated form and very deep, so as entirely to conceal the bird when sitting. It is formed of the seed-tops of reeds and long grass, and is attached to the growing stalks of three or four adjoining reeds, to which it is bound by long strips of grass, interwoven with the structure of the nest.

Thus suspended, it is liable to be swung to and fro as the reeds bend to the wind; indeed, Montague states, that he has seen this bird sitting on her nest, when the wind blew so hard that every gust forced it almost to the surface of the water. Under such circumstances, neither the eggs nor the bird could keep their place in a shallow nest; and hence the nest is made unusually deep. The eggs are greenish white, spotted with olive and brown.

THE REED-WARBLER.

In Holland the Reed Wren is very abundant; but it is principally to the south-eastern portions of our island that its summer visits are extended. Its song is varied and pleasing, and though delivered hurriedly, has few harsh, wiry sounds.

THE BLACKCAP.†

This migrating species, arriving here about the middle of April, and leaving in September, derives its name from its black hood. The French call it the *Fauvette à tête noire;* the Germans, the Monk or Moor. It frequents groves, the borders of woods, parks, and orchards, where it conceals itself amidst the foliage. It is quick and alert in its manners, and searches the leaves with singular address for insects and caterpillars. It is very partial to berries, and, on its first arrival, resorts to those of the ivy, on which it chiefly feeds, till the caterpillars of various moths are abundant. Afterwards it attacks currants, cherries, and strawberries, and last of all, the berries of the elder.

The blackcap builds its nest amidst thick intertwined bushes of white thorn, or amidst dense brambles; it is a well-built structure, composed externally of the stems of grasses, wool, moss, and the deserted cocoons of insects; internally, it is lined with fibre and hair. There are from four to six eggs, of a yellowish brown, with marks of ash gray, and brown spots.

The blackcap likes a high place for its song; choosing, where the tree is not very lofty, an elevated branch, or the top twig. As it holds up its head, and the throat is much inflated, the axis of the body is very oblique. "While the bird is trilling," says Mudie, "in which it excels every songster of the grove in rapidity and clearness, and in the swells and cadences which it gives to the same trill, the throat has a very strong convulsive motion, and the whole bird appears to be worked into a high state of excitement. It has, indeed, the wildest and most witching notes of all our warblers; it has not, certainly, the volume and variety of the nightingale, neither has it the ineffably sweet chant of the garden-warbler; but its notes take one by surprise, and the changes, and especially the trills, are finer than those of any other bird. The notes, when the bird is at rest, appear to be, by turns, like those of several birds; but it transposes them into a lower or rather a minor key, and finishes off with variations of its own; and as is the case with some of the more impassioned musical composers, the very genius (so to speak) of the bird interferes with the melody, and a sort of indescribable wildness is the character of the whole."

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* Salicaria arundinacea.

† Curruca atricapilla.

Another genus is formed of the Pipits,* whose province is the turf-clad surface of commons and pastures. They build on the ground, near marshy places, in tufts of grass or rushes, or among loose clods and stones. Many of them sing sweetly.

THE MEADOW PIPIT.†

This bird is seen on the barren hills of Northumberland and in the highlands of Scotland, as well as in the richer and warmer parts of the country. The Pipit Lark has sometimes been described, but this is only the Meadow Pipit after its autumnal moult and in its winter's dress.

THE MEADOW PIPIT.

This species often perches on low branches. It runs along the ground and catches insects in the manner of the wagtails. Its nest is made of dried grasses and fibres, and, generally lined with hair, is concealed on the ground by a bush or a tuft of herbage. The eggs are usually of a pale brown, thickly speckled with purplish brown.

The ordinary flight of the meadow pipit consists of a series of jerking undulations, at no great height, and is very different from its song-flight. During the pairing season, the male ascends to a great altitude by a rapid, tremulous movement of its wings, and when at the highest point commences his song; it then gradually descends, on motionless wings and outspread tail, obliquely to the earth.

THE TREE PIPIT, OR TIT-LARK.‡

This bird may be distinguished from the rest of the genus by having the hind claw short and curved. Its nest, formed of grasses, vegetable fibre, hair, and moss, is generally concealed under herbage. There are four or five eggs, of a grayish white, mottled with brown. There are two broods in the summer.

The Tree Pipit searches on the ground for insects with ease and celerity, but when disturbed, betakes itself to the upper part of a neighbouring tree, preparatory to a further flight. A simple *pit-pit* is the call-note of this bird.

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* Anthus.

† Anthus pratensis.

‡ Anthus arboreus.

The males, preceding the females by a week or ten days in their arrival here, repair to their respective situations, and commence their songs of invitation. Often are these strains uttered from the topmost branch of a tree where the bird is perched; but most frequently when it is on the wing, or rather poised in the air above its perch. It first rises uttering a simple twitter; when, having attained the due elevation, it commences a trilling warble, and, on expanded wings, slowly descends to the perch from which it had previously risen. During this descent, the tail is raised perpendicularly.

THE TREE PIPIT.

THE WILLOW WREN.*

This bird, called also the Yellow Wren, or Hay-bird, visits our island about the beginning of April, and leaves it in September. Well may we say on its departure :—

"Farewell, sweet bird! thou still hast been
Companion of our Summer scene,
Lov'd inmate of our meadows green,
And rural home:
The music of thy cheerful song
We've lov'd to hear; and all day long
See thee on pinion, fleet and strong,
About us roam.

"And dost thou no wise lore impart?
Yes, still thou bidd'st us act our part
With body prompt and willing heart,
While Summer lasts:
Prepar'd the course to take, that He
For us appoints, who summons thee
To climes of grateful warmth to flee
From wintry blasts.

"Oh, may that warning voice be heard,
Howe'er revealed! To thee, sweet bird,
The tongue that speaks the instructive word,
Within thee dwells:
To us, where'er around we look,
Each passing wing, the field, the brook,
But most his own unerring Book
God's wisdom tells.

"That Book directs our mental sight
To mark the migratory flight,
With power surpassing human might
On thee impress'd:—
And trains, by thy observant kind,
Man's wilful and reluctant mind,
Its refuge in God's laws to find,
And there to rest."

The Willow Wren is an admirable songster, uttering a clear, loud, piercing strain, which may be heard in the woods and groves of every part of our island, excepting Cornwall and the west of Devonshire. Very animated are its actions, and it catches insects on the wing with great address.

In May it builds an oval nest, composed of grasses, mosses, and dried leaves, lined with feathers, and with a small opening at the top. The eggs are six or seven, white, with reddish-brown spots, numerous at the larger end. The plumage of the upper surface of the willow wren is of a greenish-yellow brown; the under parts are white, tinged with yellow, especially on the cheeks, throat, and under tail coverts; an obscure streak of yellow runs over each eye.

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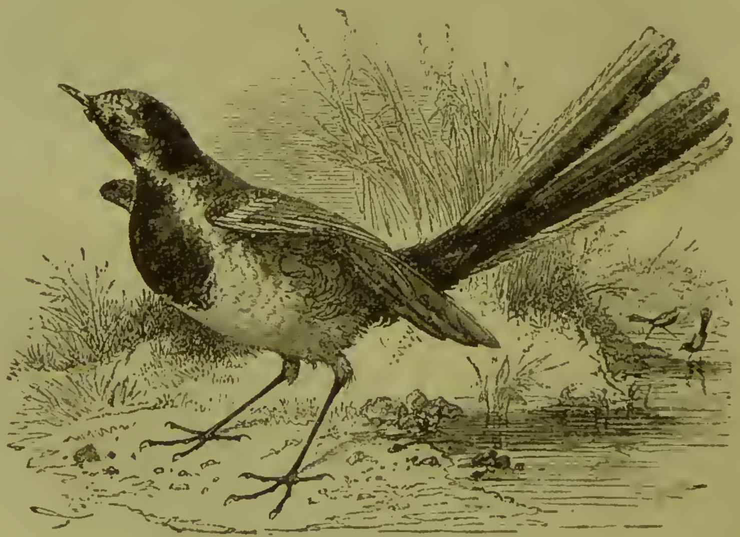
* Sylvia trochilus.

A lady was walking, in the spring, through an orchard, when her attention was attracted by something on the ground in the form of a large ball, composed of dried grass. She took it up, and found it was a nest of the willow wren. Regretting her haste, she restored it, as nearly as she could, to the place where it had been found, but with little hope that after such an attack it would be claimed by the owner.

THE WATER WAGTAIL.

To her agreeable surprise, the willow wren was, on the next day, proceeding with its work. Two eggs were speedily laid, and the kind lady now hoped that her little *protégé* was safe from harm, when alas! an invading army of splay-footed ducks marched straight upon the nest, which was conspicuous —for the grass had not grown high enough to hide it—and with their broad bills spread it quite open, displaced the eggs, and left the cozy little domicile in utter ruin. The lady now despaired; but having chased away the intruders, she did her best to restore the nest to its proper form, and placed the eggs inside. Her attention and perseverance gained a reward; for that very day she was astonished to find an additional egg, and, in about a week, four more. The bird sat, and ultimately brought forth seven young ones.



THE PIED WAGTAIL (FEMALE).

Other genera of the present family are formed of the Wagtails,* their names being derived from the remarkable, rapid, and almost incessant motion of their tails. They accompany the elevation by a jerking spread, which relaxes when it is depressed, so that the tail appears to have two simultaneous motions.

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* Motacil'æ.

As Mudie remarks, "The tarsi are long in proportion to the size of the birds; but the neck and bill, instead of being so long as to enable the latter to reach the ground, while the axis of the body is horizontal, are so short that the shoulders must *dip* much when the bill is brought to a level with the feet. A bird so formed would be very apt to tumble forwards, if it had not some means of working a counterpoise, and that counterpoise is the tail. When that is expanded and struck forward against the air, it acts in nearly the same manner as a wing, and pulls the body of the bird backwards, so that the head is raised with comparatively little effort. All birds that have the same length of tarsi in proportion to that of the neck and bill have a similar action of the tail; but as that structure, and also the habit of picking up food on a level with the feet, is more remarkable in the wagtails than in any other British birds, the motion of the tail is more powerful in them, and the tail is also longer in proportion. But the habit may be seen in very many birds, both in enabling them to raise the head and to retain it in an erect posture. The magpie is a familiar instance, and so is the peacock—which would tumble backwards, if he were to raise the body in the same manner when the tail is down as he does when it is erected and spread."

Of these birds there are several kinds, as the Pied Wagtail,* a very generally dispersed bird; the Gray Wagtail,† not so common as the last species; and the Yellow Wagtail,‡ which is frequently observable. The wagtails sing early, and sweetly, but the song is neither very loud nor very long.

THE GOLDEN-CRESTED REGULUS.§

THIS is not merely the smallest but one of the most beautiful of British birds, and yet, though abounding in most places, its active and restless habits and the silence of its movements lead to its being but little noticed.

The oak, the yew, and the various species of the fir and pine, are the usual haunts of the Golden-Crested Wren. In these tall trees it builds its nest, not merely neatly but elegantly, the shape varying according to the situation in which it is placed. It is generally like that of the chaffinch, open at the top, but sometimes, even under the sheltering boughs of a Norway fir, it is covered with a dome, and has an opening on one side. It is always ingeniously suspended beneath the branch, like those of many tropical birds, and is the only instance of the kind among our birds. The eggs, small, round, and white, are nine or ten in number.

The golden-crested regulus is not a shy bird. Though it abounds in forests, it equally frequents gardens, occasionally even in the suburbs of large towns, and very often builds close to the house. It will visit the plants trained round windows; and has been known, when pursued by a hawk, to seek refuge in a room where people were sitting, and alight on the top of the bell-rope, whence it suffered itself to be taken by the hand.

This bird remains with us all the year round. During the greater part of it, it never alights on the earth; but in the winter it is often seen pecking for insects in the grass, or among dead leaves, and even on a heath at some little distance from any tree; and when thus engaged it may be approached sufficiently near for the observer to hear the snap of its little beak in seizing its prey.

In the spring and summer it sings regularly, beginning about the middle of March, and continuing till the end of July. Its song is very soft and low, like a whisper, and, like that of the grasshopper-lark, is no louder at the distance of one yard than of twenty.

Perhaps the best time for watching it is a hot sunny day in summer or autumn. Pleasant, indeed, are its shape and plumage, surpassing, as they do, those of most of the feathered inhabitants of our woods and gardens. The plumage is a beautiful mixture of green and yellow, with white bars on its wings; and on its head is the golden crest, bordered with black, from which it takes its name.

While the golden-crested regulus never migrates with us, and never attempts on common occasions any greater flight than from tree to tree, yet it traverses the vast distance from the Orkneys to the

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* Motacilla alba.

† M. boarula.

‡ M. flava.

§ Regulus christatus.

Shetland Isles, over stormy seas, allowing no possible rest during a long passage of more than fifty miles. There it breeds, but this one object being accomplished, it leaves those isles, dares again this tedious flight, and seeks a milder clime.

Another genus* contains one of our favourite birds.

THE WREN.†

THIS well-known bird frequents gardens, hedges, and groves, near human dwellings, and rears its nest in a hay-stack, an old thorn-bush, or a hole in any old wall or building. It lays from eight to twelve eggs.

THE GOLDEN CRESTED REGULUS.

A wren, which for many years built her nest behind an oak tree, which overhung the writer's garden, was thus addressed :—

"Little warbler! long hast thou
Perch'd beneath yon spreading bough;—
Sung beneath yon ivied tree,—
Thy mossy nest I yearly see,
Safe from all thy peace annoys—
Claws of cats and cruel boys.
We often hear thy *chit-chat* song
Call thy tiny brood along;
While, in her nest, or on a spray,
The throstle charms us with her lay!
Little warbler! cheerful Wren!
Spring-time 's come, and *thou* again:
Little warbler! thou, like me,
Delight'st in home and harmless glee;
What of peace is to be found
Circles all thy dwelling round;
Here with love beneath the shade,
Thy tranquil happiness is made:
With thy tiny, faithful mate,
Here meet'st resign'd the frowns of fate;
While prouder birds fly high or far,
Or mix them in the strife of war,—
Or restless, through the wide world range,
And restless, still delight in change,
Thou mak'st *thy home*, a place of *rest*,
Affection, love, and that is best!
Then welcome, welcome, faithful Wren!
Thrice welcome to thy home again!"

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* Troglodytes.

† T. Europæus. T. vulgaris.

Clare thus sang :—

"Why is the Cuckoo's melody preferred,
And Nightingale's rich song so fondly praised,
In poet's rhymes? Is there no other bird
Of Nature's minstrelsy, that oft hath rais'd
One's heart to ecstacy and mirth so well?
I judge not how another's taste is caught;
With mine are other birds that bear the bell,
Whose song hath crowds of happy memories brought;
Such the wood Robin singing in the dell,
And little Wren, that many a time hath sought
Shelter from showers in huts where I may dwell,
In early spring, the tenant of the plain
Tending my sheep; and still they come to tell
The happy stories of the past again."

At no very distant time it was the practice of the young men in Cork, in their holiday attire, and decorated with gay and diverse coloured ribbons, to parade the city and neighbourhood on St. Stephen's day. A furze-bush in which a wren was secured was borne along, when, as they stopped before the principal houses, one of them recited the following lines :—

THE WREN.

"The wren, the wren, the king of all birds,
Was caught St. Stephen's day in the furze;
Although he's little, his family's great,
Then pray, kind gentlefolks, give him a *trate*."

Open flew the gates, and the attendants, if not the bird, were received with the utmost hospitality.

This practice was founded on two singular traditions. One was that when the birds wished for a king, it was resolved that royalty should be conferred on the one that rose highest in the air; when a wren rose aloft while an eagle was descending, perched on his back, and thus bore off the prize. The other was, that in one of the rebellions a party of royalists, worn out with fatigue, were sleeping one night in a secluded valley, and just when the enemy had come within gun-shot, a wren tapped with its bill three times on the drum, and startled the sentinel, who aroused the rest to a determined and victorious repulse!

Faber pictures pleasantly a very grave-looking wren, who seemed to be living like an anchorite, and yet he subsequently describes the bird as a "deceitful thing," thus giving his reason for so doing, and his judgment thereon :—

"Ah! yes, for long his nest has been
Behind yon alder's leafy screen,
By Rothay's chiming waters;
Two rapid years are run, and now
This monk hath peopled every bough
With little sons and daughters.

"I will not blame thee, Friar Wren,
Because among stout-hearted men
Some truant monks there be;
And if you could their names collect,
I rather more than half suspect
That I should not be free.

"Ere while I dreamed of cloistered cells,
Of gloomy courts and matin bells,
And painted windows rare;
But common life's less real gleams
Shone warm on my monastic dreams,
And melted them in air.

"My captive heart's more altered now;
And, had I but one little bough
Of thy green alder tree,
I would not live too long alone,
Or languish there for want of one
To share the nest with me!"

The fourth family* comprehends a variety of birds, among which are the thrushes, the orioles, the ouzels, and the ant-thrushes.

THE THRUSH.†

Indigenous to our island, this bird remains with us throughout the year; and in winter its numbers are increased by arrivals from the more northern parts of Europe. Of thrushes there are several kinds.

THE COMMON THRUSH.

The common thrush is one of the early songsters. Hence a poet says:—

"Sweet Thrush! whose wild untutor'd strain
Salutes the opening year,
Renew those melting notes again,
And soothe my ravish'd ear.

"Though in no gaudy plumage dress'd,
With glowing colours bright,
Nor gold, nor scarlet, on thy breast
Attracts our wondering sight;

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* Merulidæ.

† Turdus musicus.

"Yet not the pheasant, or the jay,
Thy brothers of the grove,
Can boast superior worth to thee,
Or sooner claim our love.

"How could we transient beauty prize
Above melodious art!
Their plumage may seduce our eyes,
Thy song affects our heart.

"While evening spreads her shadowy veil,
With pensive steps I'll stray,
And soft on tiptoe gently steal
Beneath thy favourite spray.

"Thy charming strain shall doubly please,
And more my bosom move,
Since Innocence attunes those lays
Inspir'd by Joy and Love."

A lady, accustomed to observation, states that the little musicians of the grove do not attain their wild and delicate modulations without practice. When lying in bed, unable to speak or move for many hours in the day, the songs of the birds supplied her with an inexhaustible source of pleasure. Numbers of blackbirds and thrushes built their nests in the garden, and the wood-pigeons which had been silent the year before, renewed their soft notes in the high trees. However, they were shy, and she thought herself fortunate if their gentle cooing found its way to her ear once or twice a day.

But there was one thrush whose notes she soon learned to distinguish from all the other thrushes. Every morning its voice was sure to precede the matins of all the other birds. In the day-time its brilliant tones were mingled and almost lost in the general melody, but as soon as the sun was preparing to set, when the blackbirds had either sung themselves to sleep, or were flown off to keep their festivities elsewhere, then came its practising time. It selected a tree not far from the window of the invalid, while the other thrushes placed themselves at a respectful distance, and edged in a note here or there, as they could. It opened the rehearsal with a number of wild trills and calls which the listener could not understand, only she found them very sweet and cheering, and it would pause between each till it heard a soft response from a distant bough.

THE GOLDEN THRUSH.

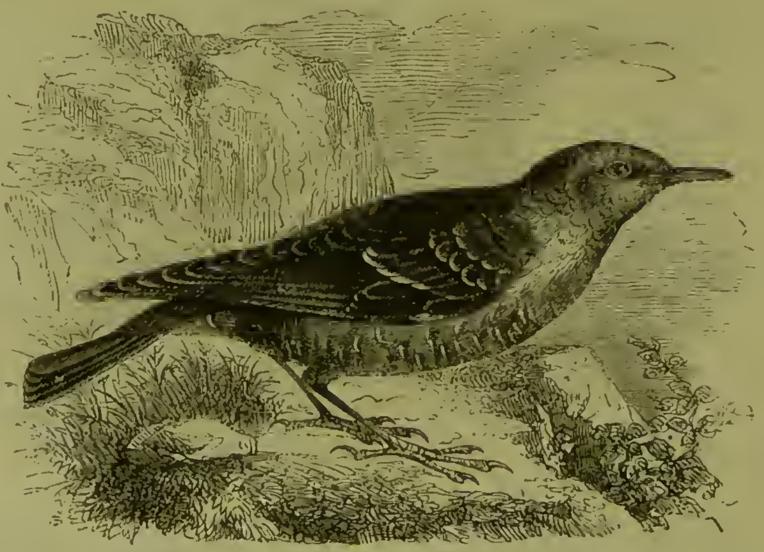
But when it had fixed on a little cadence pleasing to the songster, the thrush would chant it over in a low tone, two or three times, as if to make itself sure of the strain, and then it was poured forth with triumphant glee; when the bird would stop on a sudden, as if to say to its rivals, "Which of you can imitate my strains?" "Their notes sounded," says the listener, "most sweet at various distances during these little intervals; but they seemed conscious of their inferiority to my favourite, who would suddenly break out into the very same melody, upon which, doubtless, the songster had been musing all the while, enriching it by some little note or trill, the wildest and most touching that ever came into a thrush's heart. I needed neither concert nor music master, while I could listen to the untaught, but not unpremeditated harmony of this original professor; nor could I quarrel with the sickness which had been the means of developing another link in that mysterious chain which binds me to the rest of creation, by opening my ear and my heart more than ever to the language of universal nature."

Clare charmingly says :—

"Within a thick and spreading hawthorn bush
That overhung a molehill large and round,
I heard, from morn to morn, a merry thrush
Sing hymns to sunrise, while I drank the sound
With joy : and often an intruding guest,
I watched her secret toils, from day to day,
How true she warped the moss to form her nest,
And modelled it within with wood and clay.
And by-and-by, like heath-bells gilt with dew,
There lay her shining eggs, as bright as flowers.
Ink-spotted over shells of green and blue,
And there I witnessed, in the summer hours,
A brood of nature's minstrels chirp and fly,
Glad as the sunshine and the laughing sky."

THE MISSEL THRUSH.*

A NATIVE of our island and the continent of Europe, this bird is closely allied to the Song Thrush, exceeding it in size, but greatly inferior to it in melody and richness of voice. It is also much rarer, though in some districts, as Northumberland, and particularly in the southern counties of Ireland, it is on the increase. It is a bold, pugnacious bird, and perched on the top of a tree, will pour forth its melancholy yet musical cadences, even amidst the cold and winds of February. The Missel Thrush hails them when they blow loudest and strongest, with notes of no ordinary power, and so remarkable is this habit, as to lead to it being called "the Storm Cock."



THE ROCK THRUSH.

No bird must approach this one during the time of incubation. The Welsh call it *Pen y llwyn*, the head, or master of the coppice, for it drives the magpie, jay, or crow away with vehement cries. The hen has been known, when disturbed in her sitting, to fly at the face of man. "In general," says White, "it is very successful in the defence of its family; but once I observed in my garden, that several magpies came determined to storm the nest of a missel thrush. The dams defended their mansion with great vigour, and fought resolutely ; but numbers at last prevailed : they tore the nest to pieces, and swallowed the young alive."

This bird derives its name from the mistletoe, of the berries of which it is very fond ; its other food consists of slugs, worms, and insects. The nest is generally placed in the fork of a tree ; it appears outwardly a mass of coarse stems of plants, moss, withered grasses, and lichens ; but within it is stuccoed with mud and clay, which is again lined with delicate grasses. Here are laid four or five eggs, generally of a greenish white spotted with ruddy brown, but the colour occasionally varies to pinkish or reddish white, mottled with dark red-brown hues.

The missel thrush is apt to avail itself of any suitable materials in building its nest. In one instance, a lady lost a lace cap in spring, when out drying ; in autumn, when the leaves began to fall, something white appeared in one of the trees, and, on inspection, proved to be the cap that had been used by one of these birds in constructing its nest. In another case, a smaller offence was committed: a narrow piece of net, a yard in length, having been carried off, when bleaching, and afterwards found composing part of the nest of a missel thrush.

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* Turdus viscivorus.

The mistletoe, greatly extended by this bird, is generally found, as a parasite, on large aged apple-trees, and in the long lines of these trees, bordering the roads in various parts of France, the mistletoe grows very luxuriantly, sometimes so much as to shroud the apple-tree itself. The white berries of this shrub are eaten by the missel thrush; and the seeds passing in a state fit for germination through the alimentary canal, begin to grow, when the locality on which they fall is favourable. Very rarely does the mistletoe grow on the oak.

"Like all powerful song-birds," says Mr. Broderip, "this thrush often seems to articulate words distinctly. We have heard one express in the course of its singing sounds which fell on the ear as if it were repeating the words—'My dear—my pretty dear—my pretty little dear.' These accents were not caught up by one listener alone, who might, perhaps, have been deemed a little imaginative; but all who heard them were struck by the resemblance."

The Rock Thrush,* *Merle de Roche* of the French, is a native of Europe, inhabiting rocky and mountainous countries. It is found on the Uralean mountains, the Alps, and the Pyrenees. It also inhabits Germany, France, Switzerland, and the Tyrol, Spain, Sicily, Turkey, the Grecian Archipelago, and Algeria. It has occasionally been shot in England. We give engravings of the Rock and the Golden Thrush on pages 117 and 118.

The Ant Thrushes† follow the more typical thrushes, a race of birds strictly terrestrial, having strong elevated tarsi, abbreviated tails, and short rounded wings; and feeding on insects, particularly ants and termites. The genera are numerous; some confined to the Old and others to the New World. Their colours are gaudy, many of the tints having a metallic lustre. They stand very high on the limbs, but have feeble powers of flight.

THE MOCKING BIRD.‡

The bird who is thus not happily named, has a well-proportioned and handsome figure, but nothing brilliant in its plumage. Its celebrity arises from the extent and variety of its vocal powers.

Southey describes it as:—

"That cheerful one, who knoweth all
The songs of all the winged choristers;
And in one sequence of melodious sounds,
Pours all its music."

According to Wilson, the ease, elegance, and rapidity of his movements, the animation of his eye, and the intelligence he displays in listening, and laying up lessons from almost every species of bird within his hearing, are truly astonishing, and indicate the peculiarity of his genius. His voice, full, strong, and musical, is capable of almost every modulation, from the clear, mellow tones of the wood thrush, to the savage scream of the bald eagle. In measure and accent he faithfully follows his originals, but he greatly surpasses them in sweetness and force of expression. Mounted on the top of a tall bush or low-growing tree, in the dawn of a dewy morning, he exceeds every competitor, though the woods are vocal with a multitude of warblers. It is as if he sang alone, and the music of others were a mere accompaniment.

Not that his strain is altogether imitative. He has native notes, easily distinguishable by those who are well acquainted with the songs of birds, bold, full, and exceedingly varied. They consist of short expressions, of two, three, or, at the most, five or six syllables, generally interspersed with imitations, all of them uttered with great emphasis and rapidity, and continued with undiminished ardour, for half an hour or an hour at a time; his expanded wings and tail, glistening with white, and the buoyant gaiety of his action arresting the eye, as his song irresistibly does the ear. Sweeping round with enthusiastic ecstacy, he mounts far aloft, and descends as his song swells or dies away. A by-stander, with closed eyes, might suppose that the feathered tribes were engaged in a trial of skill, each aiming at the utmost effect, so perfect are his imitations. Often does he deceive the sportsman; sending him away in chase of birds, not perhaps within miles of him, but whose notes he exactly imitates. Even birds are frequently imposed on by this extraordinary mimic, and are decoyed by the fancied calls of their mates, or hastily dive into the thickets, alarmed at what they suppose to be the scream of the sparrow-hawk.

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* Petrocincla saxatilis.

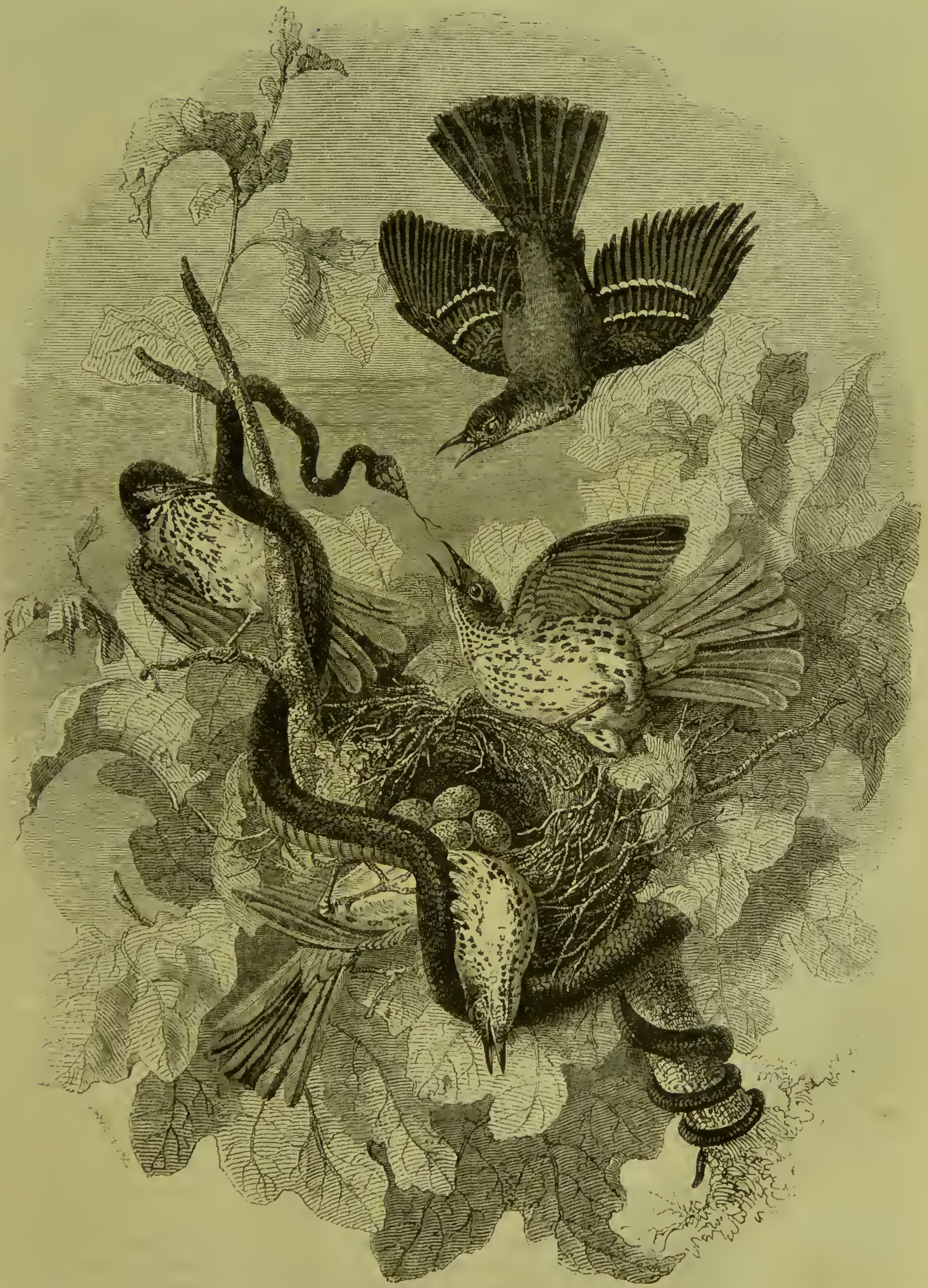
† Myothera.

‡ Orpheus polyglottus: Swainson.

The exact time at which this bird begins to build depends on the latitude in which it is found. Great discretion is always displayed in selecting a spot for its nest, a solitary thorn-bush, an almost impenetrable thicket, an orange-tree, a cedar or holly-bush being preferred, but if any of these cannot be obtained, except within a short distance from a house, it does not hesitate to build there, often choosing an apple or a pear-tree. The nests vary with the materials that may be within reach. A very complete one is described by Wilson, as consisting, first, of a quantity of dry twigs and sticks, then withered tops of weeds of the preceding year, intermixed with fine straws, hay, pieces of wool and tow, and lined with a thick layer of fine fibrous roots, of a light brown colour.

THE MOCKING BIRD.

The eggs are of a cinereous blue, marked with large patches of brown, and there are sometimes four or five. The female usually produces two broods in a season, and, if robbed of her eggs, will even build and lay a third time, though she is apt to forsake the nest, if disturbed. During the period of incubation, neither man nor animal can approach the nest without being attacked, and cats are speedily made to fly. But the bird is especially enraged by the black snake; no sooner is this reptile discovered, than the male darts on it with the rapidity of an arrow, and dextrously eluding its bite, strikes it incessantly and violently on the head, where it is very vulnerable. As the snake becomes sensible of its danger, it tries to escape, but the mocking bird is thus encouraged to redouble its exertions, and, unless its antagonist be very large, it often succeeds in destroying the foe. As the strength of the snake



THE FERRUGINOUS MOCKING BIRD.

begins to flag, the bird seizes it and lifts it up partly from the ground, beating it with its wings; and when the work is completed, the bird returns to the nest, and pours forth a song in token of victory.

In a state of domestication, the movements and sounds of the mocking bird are very amusing. It loses little of its native energy of song, and its talent is modified according as its circumstances favour or not its development. The barking of the dog, the mewing of the cat, and the creaking of a wheelbarrow, are exactly imitated. It whistles for the dog, and Cæsar starts up, wags his tail, and runs to meet his master. It squeaks like a hurt chicken, and the hen hurries about with hanging wings and bristling feathers, clucking, to protect her injured brood. It runs over the quaverings of the canary and the clear whistlings of the Virginia nightingale, or the Red-bird, with such superior execution and effect, that the songsters seem mortified, and soon become silent. The love of variety which it manifests tends, however, to impair its song. Thus, its imitations of the brown thrush are frequently interrupted by the crowing of cocks, the exquisite warblings of the blue-bird, and the cackling of hens, or the screaming of swallows, and the shrill reiterations of whip-poor-will mingle strangely with the simple melody of the robin. It may be, however, that the notes of the marten, the baltimore, and twenty others, succeed with such surprising accuracy, that the uninitiated look round for the originals, and find that the sounds, which seemed to be that of an orchestra, were those of a single bird. In its native and in its domesticated condition, it is during the solemn stillness of night, as soon as the moon rises in silent majesty, that it begins its charming solo, while through the night it is perseveringly continued until the neighbourhood rings with the inimitable melody.

THE FERRUGINOUS MOCKING BIRD.*

The admirer of woodland melody may well look on the engraving given on page 121 with the liveliest interest. A snake has attacked the inmates of the nest, while it is defended with a courageous spirit by the male bird, as he exerts all his powers to extricate his beloved mate from the coils of the reptile, which has almost deprived her of life. At the call of the male, another bird of the same species has come with a rapid flight, and with his bright eyes fired with deadly hate, he is prepared to attack the snake; while a third is grappling with the reptile, and intent on tearing its skin from its body. Who will not wish the birds to be victorious, and their united assault fatal to the invader? The desire was happily realised, for Audubon, who relates the fact, says: "The snake was finally conquered, and a jubilee held over his carcase by a crowd of thrushes and other birds, until the woods resounded with their notes of exultation. I was happy in contributing my share to the general joy, for, on taking the almost expiring bird into my hand for a few minutes, she recovered in some degree, and I restored her to her anxious mate."

The Brown Thrush, or Thrasher, as this bird is sometimes called, is a constant resident in the United States. It is the most numerous species found there, except the robin, or migratory thrush, These birds migrate by day, and singly—never congregating, notwithstanding their abundance. They fly low, or skip from one bush to another, their longest flight seldom exceeding the breadth of a field or river. They seem to move rather heavily, on account of the shortness of their wings, the concavity of which usually produces a rustling sound; and they travel very silently.

The actions of this species during the period of their courtship are very curious, the male often strutting before the female, with his tail trailing on the ground, after the manner of some pigeons, and while perched and singing in her presence, vibrating his body with vehemence. The nest is placed, without much care, in a briar-bush, a sumach, or the thickest parts of a low tree—never in the interior of the forest, but most commonly in the bramble patches which are everywhere to be met with along the fences or the abandoned old fields. Sometimes it is laid on the flat ground. The eggs are from four to six, of a pale dull buff colour, thickly sprinkled with dots of brown.

Audubon says: "No sooner has the bird reached its destined abode, than, whenever a fair morning occurs, it mounts the topmost twig of a detached tree, and pours forth its loud, richly-varied, and highly melodious song. It scarcely possesses the faculty of imitation, but is a steady performer; and, although it sings for hours at a time, seldom, if ever, commits errors while repeating the beautiful lessons set it by Nature, all of which it studies for months during spring and summer. Ah! reader, that I could repeat to you its several cadences, all so full of sweetness and melody, that one might imagine each last trill, as it dies on the ear, the careful lullaby of some blessed mother chanting her babe to repose; that I could imitate its loudest notes, surpassed only by those of that unrivalled vocalist, the mocking-bird! But, alas! it is impossible for me to convey to you the charms of the full song of the brown thrush; you must go to its own woods and there listen to it."

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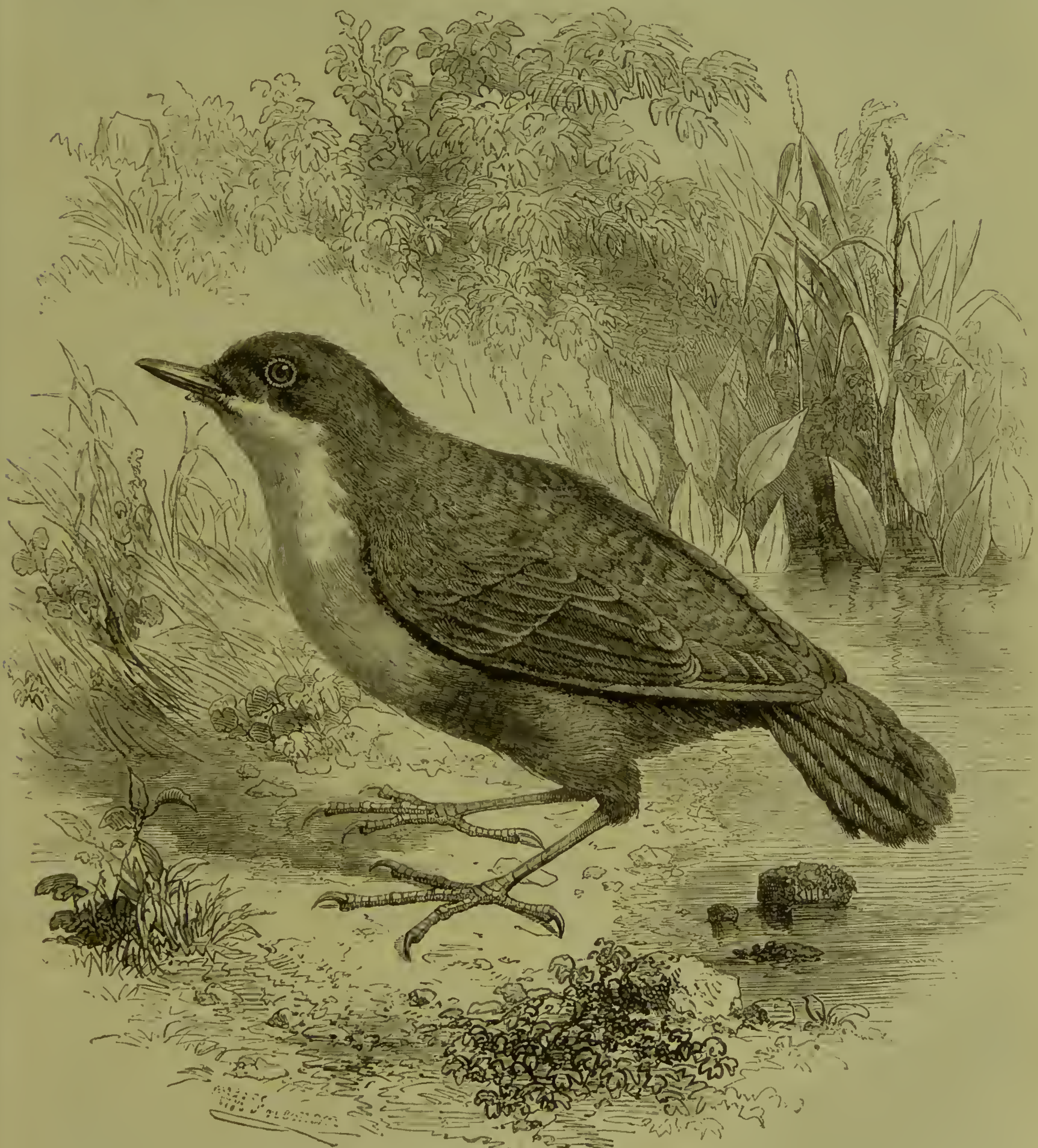
* Orpheus rufus: Linnæus.



THE WATER OUZEL.

THE WATER OUZEL, OR DIPPER.[*]

CONSPICUOUS for his snowy breast and russet dress, and remarkable for his attitudes, this bird may well arrest the attention. He may be seen on some gray limestone mass, rising a foot or two out of the water,

[*] *Cinclus aquaticus.*

and placed in the centre or at the margin of the stream, jerking his head, dipping it down, and at the same time flirting up his short tail; then, in an instant, plunging into the water and disappearing, suddenly to rise at some distance, and settling again on some jutting crag or stone, he repeats the aquatic performance.

Nor is this bird of rare occurrence. It graces the rapid sparkling streams which flow through the romantic parts of our island. It is common in Wales, Scotland, and Ireland, and also in various parts of the Continent, particularly Switzerland, wherever rocks and mountain rivulets offer it a congenial abode.

A poet truly says :—

"The bird
Is here—the solitary bird that makes
The rock his sole companion. Leafy vale,
Green bower, and hedge-row fair, and garden rich
With bud and bloom, delight him not;—he bends
No spray, nor roams the wilderness of boughs,
Where love and song detain a million wings
Through all the summer morn—the summer eve;—
He has no fellowship with waiving woods,—
He joins not in their merry minstrelsy,—
But flits from ledge to ledge, and through the day
Sings to the highland waterfall, that speaks
To him in strains he loves, and lists
For ever."

The nest of the Water Ouzel is composed of moss or rock-weeds, and is of a domed form, with a lateral entrance. Its food consists of sticklebacks, minnows, and other small fish, the fry of larger ones, small crustacea, and aquatic insects. The young, before they are able to fly, are capable of diving with great address; indeed, when disturbed, they take to the water instantly, although but half-fledged.

The ear is startled by the sonorous song of this singular bird as it mingles with the hoarse tones of the torrent, or the rushing of the wintry water-fall, sometimes when there is a storm of snow. Mr. Rennie, who remarks "that it is one of the few birds that are vocal so early in the year as the months of January and February," heard it on the 11th of the latter month, when the thermometer in the morning had been at 26°, sing incessantly, not only elegantly, but powerfully, with much variety in the notes, many of which were peculiar to itself, intermingled with a little of the piping of the Woodlark. The day was bright whilst it was singing, but it was freezing in the shade; and the sun, which had considerably passed the meridian, was obscured from the songster by the lofty surrounding hills.

THE GOLDEN ORIOLE.*

Belon supposes, in common with others, that this is the Χλωρίων of the Greeks; the *Galgulos*, *Vireo* and *Oriolus*, of the Romans; and the *Picus* which Pliny describes as suspending its nest on a twig of the topmost branches of a tree, after the manner of a cup. It is the *Fwyalchen Felen* of the Welch, and on the continent of Europe it bears a great variety of names.

The male is of a golden yellow, with a blackish brown spot between the eye and the bill; the wings and tail are black; there is a yellow spot on the quills not far from the middle of the wing when closed, and the tail feathers terminate with yellow; the bill is reddish maroon; the iris is red; the feet are of a bluish gray. It is in the third year that the male acquires his brilliant black and yellow plumage.

The female is of a greenish olive above, and of a grayish white with a yellowish tint below, where the plumage is marked by somewhat distant grayish brown short stripes or dashes disposed longitudinally; the wings are brown, bordered with olive gray, the tail is of the same hue, tinged with black; the body is yellowish beneath, with a brownish black mark, somewhat in the form of an irregular Y; she has no dark streak behind the bill and the eye.

There are generally four or five eggs, of a purplish white, with a few ash-gray and claret spots. So tenderly does the female watch over them, that it is said she will suffer herself to be captured rather than abandon them. The young of the year resemble the female, but the stripes of the lower parts are more numerous and deeper in colour.

The Golden Oriole haunts lonely groves and thickets on the skirts of woods, except in the fruit season, when it visits orchards and commits there serious ravages. The sportsman, if very clever in his imitative whistle, may so beguile the bird as to approach it, but so exquisite is its power of hearing, that one false note will make it take wing. It is very fond of figs, grapes, and cherries, but these failing, it feeds on caterpillars and insects, as well as berries. Bechstein thinks that the word *puhlo* expresses the sound it emits; others state that its whistle is loud and flute-like. Its cup, or rather saucer-shaped nest, is formed of slender grass, stems, and wool; it is placed in the fork of a branch, and usually towards its extremity.

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* Oriolus Galbula.

THE GOLDEN ORIOLE.

Of Britain it is only an occasional visitant, appearing in April, but returning in September. It has been seen in various parts of our country, rarely in Ireland, and never, it seems, in Scotland.

THE LYRE BIRD.*

THE magnificence and peculiar structure of the beautiful tail of the male, having the form of an ancient Grecian lyre, obtained for the bird, very naturally, its singular name. Its habitat is New South Wales, chiefly in the forests which cover the Blue Mountains, and in their rocky and retired avenues. The size of the first brought into the colony was that of a common hen. Only one species is yet known.

The bill is straight, having the nostrils in the centre of the beak. The base of the upper mandible is furnished with hairs like feathers turning down; the upper mandible is, at its base, somewhat like that of a pigeon. The eye is a dark hazel, with a bare space around it. The throat and chin are of a dark rufous colour; the rest, with the body, of a dusky gray. The feathers on the rump are longer than those of the body, and more divided. The colour of the wings, which are concave, is dark rufous. The legs, and particularly the claws, are large in proportion to the bird. The outward toe is connected with the middle one as far as the first joint. The tail is composed of three different sorts of feathers, of which the upper side is a dark gray, with ferruginous spots. The first two lower feathers, which are a little curved in two directions, are, beneath, of a pearly colour, enriched with several crescent-shaped spaces, of a rich rufous and black colour. The laminæ are unwebbed, turned round toward the extremity, and ornamented with a black bar, the breadth of an inch, and fringed at the end. The shaft of the second, which is likewise long, is fringed with long hair-like filaments; and the third,

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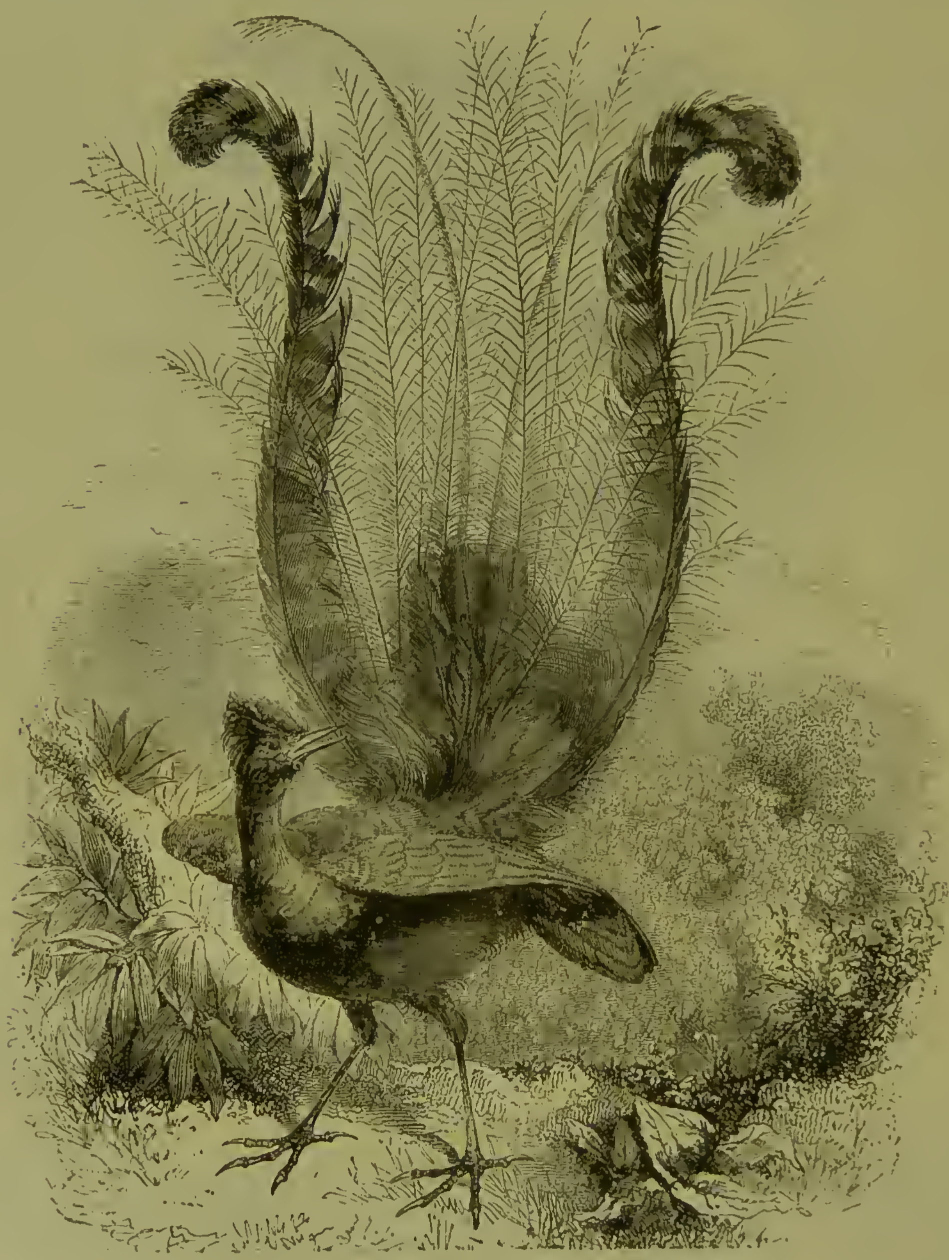
* Mœnura superba. M. lyra or lyrata.



THE LYRE BIRD.

which is also long and curved, is plumed on the inner side only, except at the extremity, where there are a few separated filaments of a dark gray colour.

The tail of the female is simply brown, and composed of long uniform feathers, which are straight and graduated.

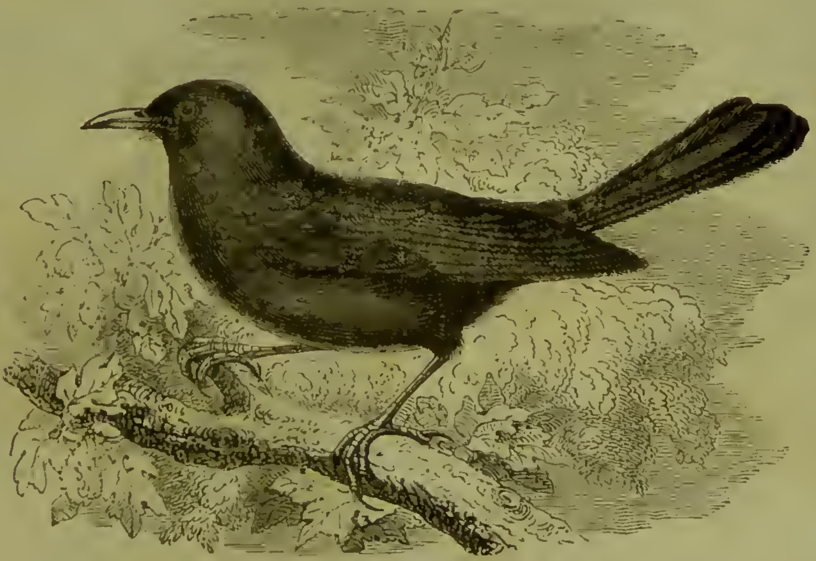
"It is much to be regretted," Mr. Bennett justly remarks, "that human beings are so eager to destroy, even to extermination, the races of animals, useful or dangerous, which may be found in a new country. In the settled parts of a colony, the harmless kangaroos and emus are rarely seen, when they might be easily domesticated about the habitations. The same remark applies to the lyre pheasant. Why are they not domesticated before, by extermination, they are lost to us for ever?"

The tail-feathers are detached entire from the bird, and are sold in the shops in Sydney in pairs. The price was formerly low, but as the bird has, from being destroyed, as it was not aforetime, become rare, the tails fetch from 20s. to 30s. the pair. About the ranges of the Tumal country, where the gun has seldom been carried, they are more frequently seen. Mr. Bennett is our authority for the following particulars:—

This bird has its young, like all the wild animals, in the country, and can there be most easily procured. It is heavy in flight, but swift of foot. On catching a glimpse of the sportsman, it runs rapidly, aided by the wings, in getting over logs of wood, rocks, or any obstruction to its progress; it seldom flies into trees, except to roost, and then rises only from branch to branch. These birds build in old hollow trunks of trees which are lying on the ground or in the holes of rocks. The nest is formed merely of dried grass or dried leaves, scraped together. The female lays from twelve to sixteen eggs, of a white colour, with a few scattered blue spots. The young are difficult to catch, as they run with rapidity, concealing themselves among the rocks and bushes. The lyre bird, on descending from high trees, on which it perches, has been seen to fly some distance. It is more frequently observed during the early hours of the morning, and in the evenings, than during the heat of the day. It scratches about the ground and the roots of trees, to pick up seeds and insects. The aborigines deck their greasy locks with the splendid tail-feathers of this bird, when they can procure them.

THE BLACKBIRD.*

Those who live in the country, and who are apt to wake early on spring mornings, when all around is still, and the lark himself is yet on the ground, must often have been charmed with the solitary song of the Blackbird, a brief stave of six or seven notes only, followed by an interlude of silence, during which the ear listens eagerly for its repetition.



THE BLACKBIRD.

This warbler loves to hide itself in "darkling covert," and there, shrouded among foliage, to pour forth its songs. It frequents shrubberies, large gardens, thick hedgerows, and the borders of woods. A bower of ivy, a thick laurel hedge, or a solitary bush of some luxuriant evergreen, is a favourite site for its nest. It often builds close to the house, and in places where it is constantly passed and repassed, as near a garden-walk. It has been seen in the laurel hedge, bordering the play-ground of a ladies' school, and though the inmates often took a peep at "the pretty birds," yet they there brought up their brood. The blackbird is more recluse than the thrush, and more suddenly flits, when disturbed, to its covert. The nest, formed of fibres, moss, and small twigs, is lined with mud, over which is spread a layer of fine dry grass. There are four or five eggs, of a fine bluish-green, with darker blotches.

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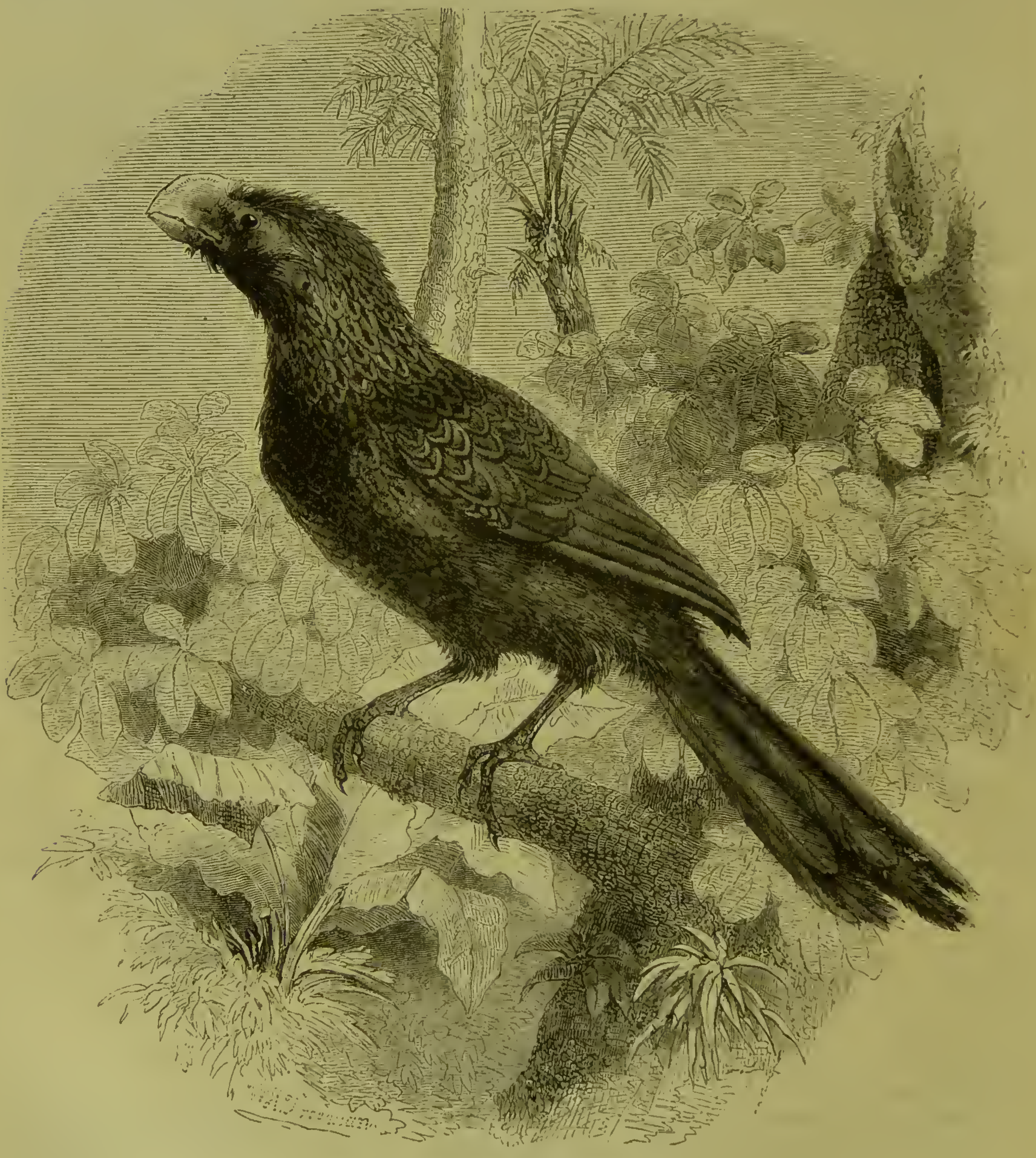
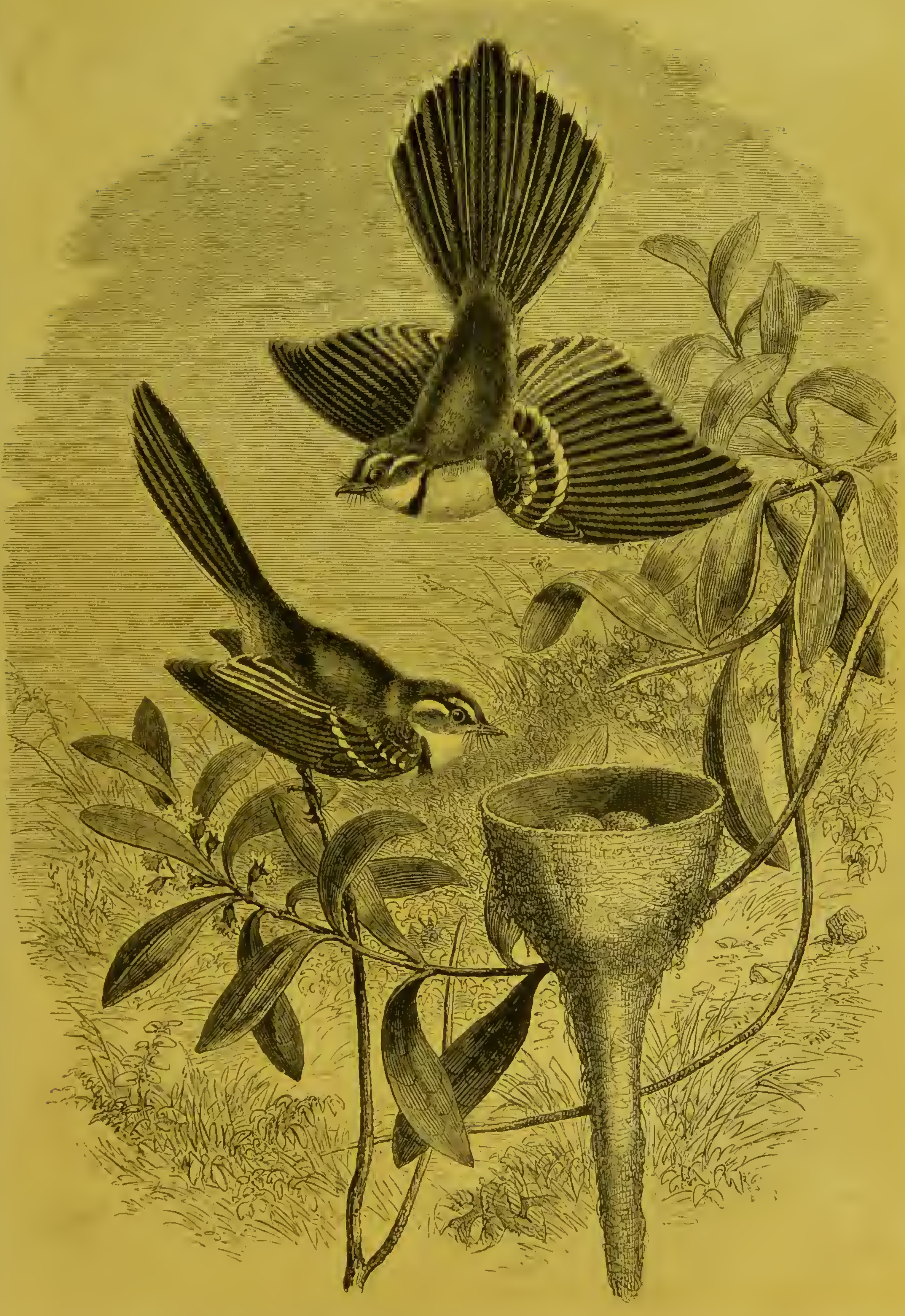
* Merula vulgaris.



THE JAMAICA BLACKBIRD.

In 1836, numbers of people went to Mr. Boxwell's, of Lyngestown, to hear a blackbird in the shrubberies that clapped his wings and crew like a bantam-cock. In captivity the blackbird may be taught to whistle a variety of tunes, and even to imitate the human voice.



THE WHITE-SHAFTED FANTAIL.

THE JAMAICA BLACKBIRD.*

This bird is rather smaller than a jackdaw, and larger than a common blackbird. It is black all over, and splay-footed, like a parrot. It has a long square tail, a broad compressed bill, and a short thin tongue, but the upper part of the bill is flattened on the sides, arched and sharp above, and straight at the edges below. It frequents moist savannahs and the neighbourhood of water, in the West India Islands and in some parts of South America.

These blackbirds haunt the woods on the edges of the savannahs, making a loud noise at the sight of mankind, which alarms all the fowls in the neighbourhood. They live chiefly on ticks and other small creatures, and may be seen jumping about the cows and oxen in the fields—"nay," says Browne, "they are often observed to fly on their backs, unless they lie down for them, which, if much troubled with ticks, they generally do, when they see the birds about them; but if the beast be heedless, they hop once or twice round it, looking it very earnestly in the face every time they pass, as if they knew it is only requisite for them to be seen to be indulged. They are very noisy birds, and one of the most common sorts in all the pastures of Jamaica. Their flight is low and short."

THE WHITE-SHAFTED FANTAIL.†

The plant on which this bird—observed particularly in Van Diemen's Land—has made its nest, as shown in the engraving, is the *Culcitium salicinum.* The bird is generally found in pairs, but Mr. Gould has occasionally seen as many as four or five together. It inhabits alike the topmost branches of the highest trees, those of a more moderate growth, and the shrouded and gloomy-foliaged dells in the neighbourhood of rivulets: from these retreats it darts out a short distance to capture insects, and, in most instances, returns again to the same branch it had left. While in the air it assumes a number of lively and beautiful positions; at one moment mounting almost perpendicularly, constantly spreading out its tail to the full extent, and frequently tumbling completely over in the descent; at another, it may be seen flitting through the branches, and seeking for insects among the flowers and leaves, repeatedly uttering a sweet twitting song.

The elegant little nest of the White-Shafted Fantail, closely resembling a wine-glass in shape, is woven together with exquisite skill, and is generally composed of the inner bark of a species of *Eucalyptus*, neatly lined with the down of the tree-fern, intermingled with flowering stalks of moss, and outwardly matted together with the webs of spiders, which not only serve to envelop the nest, but are also employed to strengthen its attachment to the branch on which it is constructed. The eggs are invariably two in number; their ground white, blotched all over, but particularly at the larger end, with brown, slightly tinged with olive. In its disposition, this little bird is one of the tamest imaginable.

We now come to another family,‡ which is exceedingly diversified. One genus§ contains various species, remarkable for the beautiful colours of their plumage, while the markings are very nicely defined.

"Every species of titmouse," says White, "winters with us: they have what I call an intermediate bill, between the hard and the soft."

The tits are unfavourably regarded by the cultivator, and therefore a few words are required in their defence. It is true they come on the ground in gardens, when the small seeds are newly sown, and they may sometimes twitter about the sprays in spring; but as, in the one case, they do not devour the seeds, so, in the other, the buds are not their prey. Their look-out is for insects, and the number of the eggs and caterpillars they pick up would, if left, be quite sufficient to disfigure the trees and ruin the crops.

The caterpillars not only do much mischief themselves, but, battening in the very cores of the young buds, they bring on a languid action of the trees. The rays of the sun, therefore, which in healthy plants call forth a rich and luxuriant foliage, induce a saccharine condition of the sap, which fosters the congregating caterpillars. These now appear swarming on the trees, secure, during the day, in their silken tents, but eating voraciously at night, till not a particle of green is left, so that, if the tree does not perish, it remains inactive during the year.

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* Crotophaga ani. † Rhipidura albiscapa: Gould. ‡ Pipridæ. § Parus.

Nor is this all. Without the action of the leaves thus destroyed, the sap does not change into a healthy cambium, fit to yield new layers of wood and bark, which, when a tree ceases to produce, its decay is begun. Hosts of insects, from the saccharine surface of the tree, lay siege to it, even to its root; so that the bole and branches become full ot sores; half the top dies, branch after branch; and unsightly and unproductive are the miserable remains of a tree, once ornamental and fruitful in its season.

Such would be the natural course with most trees, and with all those bearing the finer fruits especially, if the buds were not cleared by birds, and among these the tits render eminent service. Though greatly differing in size, they resemble the crows, not merely in the form of their bills, but in the firmness and strongly-contrasted tints of their plumage, as well as in their indiscriminate feeding and their disposition to kill and eat young and weakly birds.

THE CRESTED TITMOUSE.

The bills of the tits are small, short, compressed, very firm and strong, and pointed at the tip. The birds have a very free and, considering their size, powerful action of the neck, and they strike with the point of the bill as with a chisel or pickaxe. By this action of the beak, they dig very successfully into the crevices of bark or the folds of buds, and extract thence the caterpillars, of which they are such general and incessant destroyers. When they eat seeds with hard coats, they do not crush them, but tear them in pieces by repeated strokes of the bill. They capture prey, also, by the snap of the bill; and they kill young and weak birds by striking them on the head till they have broken the skull, the contents of which they immediately devour.

Mudie says, with great truth and force:—"The microscopic power of the eyes of these little birds, which seek for minute prey on the bark of trees, is as wonderful as the telescopic range of the eyes of eagles and other birds which soar aloft, and scan a horizon of miles; and not the least wonderful part of the whole matter is, the ease with which the eye changes from telescope to microscope.

"The eye of the eagle, which can discern the motion of a small quadruped at the distance of more than a mile, can shorten its focus, so as to be keen and perfect at the distance of a few inches; and the tit, to whose near vision the eggs of flies must appear as large as musket-bullets do to us, feels no difficulty in seeing a bush at the distance of more than a hundred yards. We may admire, but we cannot imitate, that wonderful mechanical skill which can, in an organ not altogether larger than a pepper-corn, produce so many focal lengths in the same crystalline lens, instantly adapt the *retina*, or sentient tissue, to all of them, manage the admission of the proper light by the iris, and remove the colours and correct the aberrations by the other humours—all, as it were, in an instant, without effort. We leave the subject, with our warmest recommendation of it, to the general reader; to the scientific it needs no recommendation."

THE CRESTED TITMOUSE.*

In the temperate parts of Russia this bird is said to remain throughout the year, and it is also found in Denmark and Sweden. It builds its nest in a tree of the pine forests, and lives on small seeds and insects. Hence it frequents the forests of Germany, and the tree-covered mountains of Switzerland. Colonel Montagne says:—"The crested tit has not been found in South Britain, but it is not uncommon amongst the large tracts of pines in the north of Scotland, particularly in the forest of Glenmoor, the property of the Dukes of Gordon, from whence we have seen it."

The weight of this bird is about two drams and a half. The nest is built in one that the crow or squirrel has deserted. The eggs are white, with small red spots.

THE GREAT TITMOUSE.†

This bird does not migrate, but remains throughout the year in the same district. It is found in very different climates, as in the genial region of Italy, and among the snows and ice of Russia. With us, it inhabits woods, the neighbourhood of gardens, and other inclosed spots in summer, and in winter it approaches the dwellings of men. It forms a nest of moss, which it lines with hair and feathers, and places in a hole of a wall or the hollow of a tree; but sometimes chooses the deserted abode of a crow or a magpie. The eggs vary from six to nine in number; they are white, spotted and speckled with pale red.

THE GREAT TITMOUSE.

THE LONG-TAILED TITMOUSE.‡

Amidst woods, shrubberies, and tall hedges this bird may be frequently seen, as it remains in England throughout the year. Our distinguished naturalist, Mr. Yarrell, says:—"The nest of this species is an example of ingenious construction, combining beauty of appearance with security and warmth. In shape it is nearly oval, with one small hole in the upper part, through which the bird enters. I have never seen more than one hole. The outside of this nest sparkles with silver-coloured lichens adhering to a firm texture of moss and wool, the inside is profusely lined with soft feathers. The nest is generally placed in the middle of a thick bush, and so firmly fixed, that it is mostly found necessary to cut out the portion of the bush containing it, if you are desirous of preserving the natural appearance and form of the nest.

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* Parus cristatus. † Parus major. ‡ Parus caudatus.

"In this species the female is known to be the nest-maker, and to have been occupied for a fortnight or three weeks in completing her habitation. In this she deposits from ten to twelve eggs; but a larger number are occasionally found; they are small and white, with a few pale red specks, frequently quite plain. The young family of the year keep company with the parent birds during their first autumn and winter, and generally crowd close together on the same branch at roosting-time, looking, when thus huddled up, like a shapeless lump of feathers only. These birds have several notes, on the sound of which they assemble together. One of these call-notes is soft and scarcely audible; a second is a loud chirp or twitter; and a third is of a hoarser kind."

One pair of tits placed their nest in the upper part of an old pump, fixing it on the pin in which the handle worked. It happened that, during the building and laying, the pump had not been in use. When again set going, the female was sitting, and it was supposed the motion of the pump-handle would drive her away, but the young brood were hatched in safety, though part of the tail of the mother was worn off by the friction of the pump-handle. Another pair chose a pump-handle for the same purpose, and, for several days, continued to insert materials for the nest close on the joint of the handle, though every time it was raised they were either crushed or forced out. At length the patience of the little builders—and great it was—was utterly exhausted.

THE LONG-TAILED TITMOUSE.

THE COLE-TITMOUSE.*

THE patches of white on this bird render it easily distinguishable from others. Its favourite locality appears to be the fir plantations, on plains that are rather high and dry, while the trees are so young as to be branched near the ground; or on the outskirts of forests, where the trees are more apart than in the centre, and never so completely lose their natural branches, and where the young have space and air.

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* Parus ater.

This bird has a song; little else, indeed, than the same note repeated four or five times; but it has so much variety of pitch and tune as to form a sort of cadence, "which," it has been said, "would make a good variety anywhere, as it is shrill and clear; and which is particularly welcome and cheering in those mountain woods which the summer warblers but rarely visit. The bird sings in the noon-tide heat, when most birds—and especially those on the open wastes, with which the haunts of this species are usually interspersed—are silent. While the Cole-tit is singing away in the plantation of half-grown pines, often heard, but seldom seen, the marsh species may be seen flitting about among the long and fragrant bloom which often grows thick in the neighbourhood; but, as the one is heard while the other is seen, this causes them to be confounded."

NEST OF THE LONG-TAILED TITMOUSE.

THE BLUE TITMOUSE.*

This is a beautiful and lively little bird, and is sometimes called the Tom-tit. The forehead, sides of the head, and cheek, are white, divided by a black line across the eye; the crown of the head is blue; the nape and collar round the neck, bright azure; the back, a mixed tint of azure, gray, and green. The female is a little paler in the tints than the male, has less blue on the head, and is rather smaller in size.

The bill of the Blue-tit, though short, is exceedingly strong; and Montague supposes that, when it cannot find a hole suitable for its nest, it either hews out one or enlarges it to its mind. "In one of these nests, which I lately examined," he says, "in the hole of an oak, at Shooter's Hill, in Kent, the wood, which was, indeed, decayed and soft, had evidently been cut away, so as to give an upward winding entrance to the nest; and I have remarked a similar winding, either upwards or on one side, in the nests of this bird, built in old stone walls, mortar, or small stones, having, probably, been removed with this design. The power of its bill, in such cases, I had an opportunity of witnessing, in one which was kept in a cage. In a common wire cage it could not be confined for many minutes, as it always warped the wires aside, first with its bill, and then with its body, till it got out; but it did not find it so easy to escape from a cage made with netted wax-thread; upon finding which unmanageable, it attacked the wood-work, and into one of the dove-tailings of which it thrust its bill, acting with it in the manner of a wedge. It was unsuccessful, indeed, in unhinging this, but I have no doubt that half the force and skill which it exhibited would have proved sufficient to hew out a nest-hole in a decayed tree."

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* Parus cœruleus.

THE BLUE TITMOUSE.

The eggs of the blue-tit are six or seven in number, rarely eight, white, speckled with rust-colour at the larger end. The female is tenacious of her nest, and will often suffer herself to be taken rather than quit it, and will frequently return again after being taken out. On such an occasion it menaces the invader in a singular manner, erecting all its feathers, and hissing like a snake, or uttering a noise like the spitting of a cat; and, if handled, bites severely. It has no song, but makes a shrill chirping noise, quickly repeated. The blue-tit is found in every part of Europe.

THE BEARDED TITMOUSE.*

THE male bird is very remarkable, having black between the bill and the eye, and these black feathers are very long and prolonged on each side on the lateral part of the neck. The female has no black moustaches.

This bird is nowhere so abundant as in Holland; but it is found in England, in the north of Europe, and in Asia, on the shores of the Caspian Sea.

THE BLACK-CAP TITMOUSE.†

IN America and Canada, during autumn, families of these birds are seen roving and chattering as they go through the woods, busily engaged in gleaning their multifarious food, along with nuthatches and creepers, the whole forming a busy, active, and noisy group, whose manners, food, and habits bring them together in a common pursuit. Their diet varies with the season; for, besides insects, their larvæ and eggs, of which they are more particularly fond, in the month of September they leave the woods, and assemble familiarly in the orchards and gardens, and even enter the thronging cities in quest of that support which their native forests now deny them.

Large seeds of many kinds, particularly those which are oily, as the sun-flower, pine, and spruce kernels, are now sought after. These seeds, in the usual manner of the genus, are seized in the claws and held against the branch until picked open by the bill to obtain their contents. Fat of various kinds is also greedily eaten, and they regularly watch the retreat of the hog-killers in the country, to glean up the fragments of meat which adhere to the places where the

THE BEARDED TITMOUSE.

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* Parus biarmicus.

† Parus atricapillus.

carcases have been suspended. At times they feed on the wax of the candle-berry;[*] they likewise pick up crumbs near the houses, and search the weather-boards, and even the window-sills, familiarly, for their lurking prey, and are particularly fond of spiders and the eggs of destructive moths, especially those of the canker-worm, which they destroy in all the stages of its existence. The song of these birds is very peculiar. In all cases the first syllable is very high and clear, the second drops low, and ends like a feeble plaint.

The next family of the dentirostral tribe consists of the Manakins.[†] These birds form an extensive family; Latham enumerates some forty of them. They appear to be a restless class of birds, like some found in our own country, who seem ever to be on the alert in pursuit of knowledge under difficulties, of the organisation and tenantry of every spray of every bush which they can visit.

THE ROCK MANAKIN.[‡]

The Rock Manakin is one of the most elegant birds of the present family. It is about the size of a small pigeon: the general colour of the plumage is rich saffron-yellow, with a tinge of orange; the head is adorned with a beautiful crest, flattened at the sides, and rising like a fan. It is a native of South America, inhabiting the rocky and mountainous districts along the rivers of Surinam, Cayenne, and Guiana; and probably it may be found along the whole range of the river Amazon, with its tributary branches. According to Latham, it is nowhere so frequent as in the mountain Luca, near the river Aprouack, where it builds in the cavernous hollows and dark recesses. The nest is composed of a few dry sticks, and the eggs are two in number, of the size of those of a pigeon, and equally white.

THE ROCK MANAKIN.

The rock manakin is a shy and solitary bird, preferring silent and secluded glens, and rocky ravines, to all other spots; and there it seems to pass an undisturbed existence. Wharton states that it is a native of the woody mountains of Macoushia, a tract on the Apoura-poura, a tributary river falling into the Essequibo from the south, inhabited by the Macoushi Indians, so celebrated for their skill in preparing the deadly vegetable poison wourali, with which they smear the points of their arrows. In the day-time it retires among the darkest rocks, and only comes out to feed a little before sunrise and at sunset. So gloomy is its disposition, that it never associates with the other birds of the forest.

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[*] Myrica cerifera.

[†] Piprinæ: Swainson.

[‡] Rupicola crocea

THE GREEN MANAKIN.*

In Sumatra, Java, and other islands of the East, this bird is found. Its plumage is of a beautiful emerald-green; and its wings are traversed by three black bands. This bird is not easily seen, its colour so fully blending with that of the tree on which it lives.

THE GREEN MANAKIN.

THE FORK-TAILED MANAKIN.†

The Fork-tailed Manakin is one of the birds which represents this family in America. Its beak is short and bent; its tail, as the name of the bird implies, is greatly forked.

Great numbers of the true manakins, forming the restricted genus *Pipra*, are discovered in caverns, where one cannot enter except with torches. The male and female are equally lively and extremely wild. It is impossible to shoot them, except by remaining concealed behind a rock for some hours; for the instant they perceive the hunter, they fly off very rapidly; but their flight is short and low. The males issue from the caverns more frequently than the females, which seldom show themselves, and probably only come out during the night. They have the habit of scratching the ground, and clapping and shaking their wings like cocks and hens; but this is the only point of relation between them and the latter birds, for they neither have the crowing of the cock nor the crying of the hen. They are easily tamed, and sometimes left at liberty to live and run about with the poultry.

The manakins, which have been principally observed in Guiana, prefer humid and cool woods to the hot and dry lands. They do not, however, frequent marshes, or the borders of streams. They only perch on the middle branches of trees in the woods, which they never quit to proceed into the open plains or to the neighbourhood of habitations. They assemble in the morning, in small troops of from eight to ten in number of the same species, and frequently join company with other small birds. At such times their chirping is rather agreeable. But about nine o'clock they separate, and retire alone, until the following day, into the most shady recesses of the forests. Their food consists of little wild fruits; they also eat insects.

THE CRESTED PARDALOTUS.‡

This is a bird of South America. The occipital crest is red; the body beneath yellow, and above olive green; the base and tip of the bill are black, the middle horny; the feet are black.

One genus§ is known by its thick, short beak, inflated on every side, slightly compressed towards the end. The forms and colours of one species resemble those of our common pies. To this must be added the Falcunculus of Vieillot, which is peculiar for the lower and upper jaw, both being incurved. This bird is found only in the Oceanic Islands.

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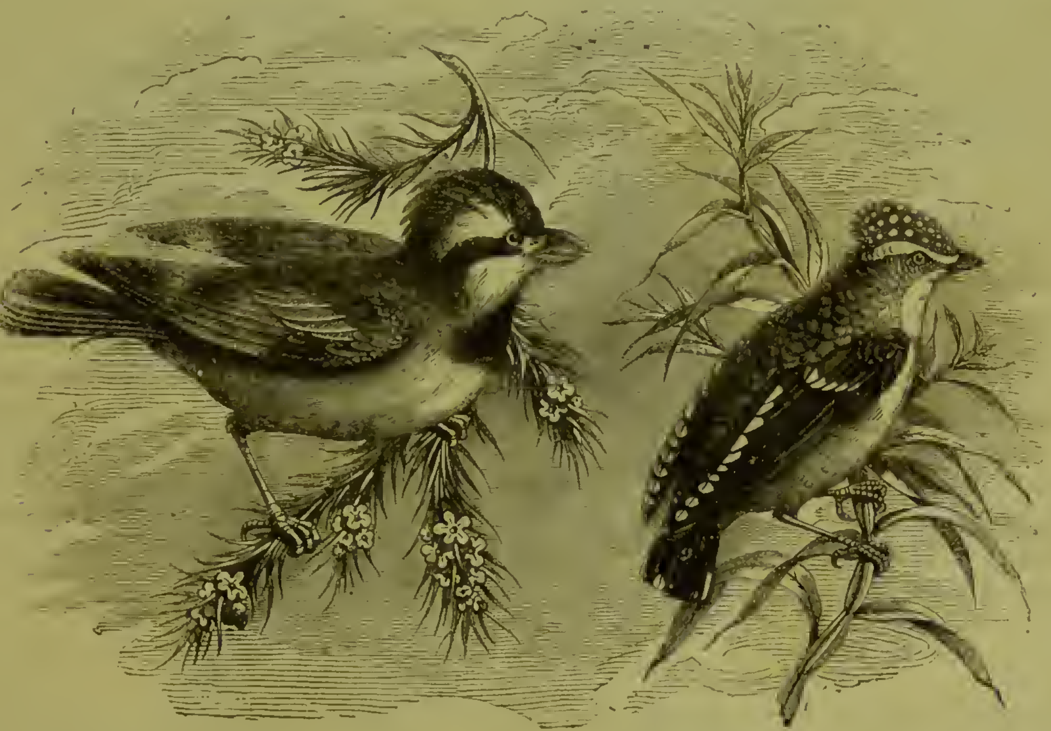
* Rupicola viridis: Temminck. † Ampelis garrulus. ‡ Pardalotus cristatus. § Bethylus: Cuvier.

Another genus* contains the Cotingas, which, having a weak bill, seek insects, berries, and tender fruits. They reside in the humid places of America, and are remarkable for the purple and azure colours of the plumage of the males during the breeding season. During the rest of the year both sexes are tinted gray-brown.

The Scarlet Cotinga is found, Mr. Waterton states, in the deepest recesses of the forest: its crown is flaming red; to this abruptly succeeds a dark shining brown, reaching half way down the back. The remainder of the back, the rump, the tail, the extremity of which is edged with black, are of a lively red; the breast reddish-black; the wings brown. This bird has no song: it is solitary, and utters a monotonous whistle, which sounds like "quet." It is fond of the seeds of the hitea tree, and those of the siloabali, which ripen in December, and continue on the trees for above two months. It is found throughout the year in Demerara; but nothing is known of its incubation.



THE CRESTED PARDALOTUS. THE FALCUNCULUS.

THE CEDAR-BIRD.†

This bird has a graceful crest, which can be so lowered and contracted close to the neck as not to be observed, but which, when erected, gives it a gay and elegant appearance. Its plumage is of an exquisitely fine and silky texture, and extremely smooth and glossy. It is often regarded as one of the "chatterers," yet it makes only a feeble lisping sound, chiefly when it rises or alights.

The cedar-birds fly in compact bodies, of from twenty to fifty; and usually alight so closely together on one tree, that the half of them are frequently shot down at one time. In the months of July and August they collect together in flocks, and retire to the Blue Mountains, and other collateral ridges of the Alleghany, to enjoy the fruit of the whortle-berries, which grow there in the greatest profusion. In October, they descend to the lower and cultivated parts of the country, to feed on the berries of the sour gum and red cedar, of which last they are immoderately fond. Thirty or forty of these birds may sometimes be seen fluttering among the branches of one small cedar-tree, and eagerly plucking off its fruit. They are also found as far south as Mexico.

The nest is large for the size of the bird, and is fixed in the forked or horizontal branch of an apple-tree, ten or twelve feet from the ground. Its exterior and its lower part are formed of a mass of coarse, dry stalks of grass; the inside is entirely lined with very fine stalks of the same material. There are three or four eggs of a dingy bluish-white, thick at the great end, tapering suddenly, and becoming very narrow at the other. They are marked with small, roundish spots, of various sizes and shades of black, and the great end is of a dull pale-purple tinge, marked likewise with various shades of purple and black. The female, if disturbed, darts from the nest in silence to a considerable distance; but no notes of wailing are heard from either parent, nor are they even seen, though the cause of the alarm be in the tree, examining the nest and the young. "The season of love," says Wilson, "which makes almost every other small bird musical, has no such effect on them; for they continue, at that interesting period, as silent as before."

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* Coracina: Vieillot.

† Ampelis Americana.

Audubon states that these birds are excellent fly-catchers, spending much of their time in the pursuit of winged insects, but having little vivacity or energy of action. They start from the branches and give chase to the insects, ascending after them for a few yards, or moving horizontally towards them, perhaps rather further than when ascending, and as soon as the prey is secured, they return to the spot, where they continue watching with slow motions of the head. Towards evening this amusement is carried on for half an hour or an hour at a time, and is continued longer at the approach of autumn, the berries then becoming scarcer.

This species is peculiar to America. Very few of them, however, remain the whole winter in the Middle States.

Intimately connected with the genus *Ampelis*, to which these birds belong, is that of *Procnias*, which includes the Campanero, or Bell-bird of South America. This bird is about the size of the jay, and its plumage is white. A spiral tube rises from its forehead, extending, as Waterton assures us, to no less than three inches in length, and communicating with the palate in such a way that, when filled with air, it looks like a spire. At other times it hangs down. The note of this bird is loud and clear, like the sound of the tolling of a bell, and we are assured that it falls upon the ear so suddenly and solemnly that it is often very startling. The toll of its voice sounds through the far-stretching wood, and then there is a silence; again the toll is repeated, and so distinctly is it uttered that it may sometimes be heard at the distance of three miles.

THE UMBRELLA BIRD.*

This singular-looking bird is brought from the country bordering the river Amazon. Outspreading plumes tower above the head, like the horse-tail crest of a Grecian hero's helmet. The bird is about the size of a jay; from the upper part of the chest depends a sort of apron or screen, of square-edged feathers, which is very graceful; and the tail is graduated. The whole of the plumage is jet-black, with rich violet reflexions, particularly on the crest and the chest plumes. Several specimens of it may be seen in the splendid ornithological gallery of the British Museum.

We have now reached the last genus† of the second tribe, the birds of which are known by the English names of Wax-Wings or Waxen Chatterers. Only three species have been recorded. One is Oriental; the second is confined to North America; and the third is now to be described.

THE BOHEMIAN WAX-WING.‡

The name of this bird, as associating it with Bohemia in particular, is not strictly accurate; for, in the central and southern parts of the European continent it is only, as it is in England, an accidental visitor in winter. Still it has a very extensive geographical range, east and west. Of these birds the Prince of Canino says:—"It seems probable that their chief place of abode is the oriental parts of the old continent; and, if we may hazard an opinion, we should not be surprised if the extensive and elevated table-land of Central Asia were found to be their principal rendezvous, whence, like the Tartars in former times, they make their irregular excursions."

"This elegant bird," says Sir John Richardson, "has only lately been detected in America, having been discovered in the spring of 1826, near the sources of the Athabasca, or Elk River, by Mr.

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* Cephalopterus ornatus.

† Bombycilla.

‡ Bombycilla garrula.

Drummond, and by myself, the same season, at Great Bear Lake, in latitude 65°. In its autumn migration southward, this bird must cross the territory of the United States, if it does not actually winter within it; but I have not heard of its having been hitherto seen in America to the southward of the fifty-fifth parallel of latitude. The mountainous nature of the country skirting the Northern Pacific Ocean being congenial to the habits of this species, it is probably more generally diffused in New Caledonia and Russian-American territories, than to the eastward of the Rocky Mountain chain. It appears in flocks at Great Bear Lake about the 24th of May, when the spring thaw has exposed the berries of the Alpine arbutus, marsh vaccinium, &c., that have been frozen and covered during winter. It stays only for a few days; and none of the Indians of that quarter, with whom I conversed, had seen its nest; but I have reason to believe that it retires in the breeding season to the rugged and secluded mountain-limestone districts, in the sixty-seventh and sixty-eighth parallels, where it feeds on the fruit of the common juniper, which abounds in these places."

THE UMBRELLA BIRD.

Sir J. Richardson adds:—"I observed a large flock, consisting of at least three or four hundred individuals, on the banks of the Saskatchewan, at Carlton House, early in May, 1827. They alighted in a grove of poplars, settling all on one or two trees, and making a loud twittering noise.

They stayed only about an hour in the morning, and were too shy to allow me to approach within gun-shot."

The whole plumage of this bird is soft and silky, and the feathers on the top of the head are elongated, so as to form a crest. The head and upper parts of the body are reddish ash-colour, inclining to gray at the lower part; and a black stripe passes from the nostrils over each eye to the back of the head. The feet are black, and so are the few feathers; the third and fourth are tipped with white, the five following with yellow on the outer plume; and, besides this, in many of their feathers the shafts end in a smooth, horny, oval tip, of the colour of red sealing wax. Of these the female has never more than five, the male sometimes as many as nine on each side.

This bird generally makes its appearance in Great Britain in large flocks, when it betakes itself to the hedges and rowan trees, to feed on their berries. It has been met with frequently in Scotland, and yet at such irregular and often distant periods, that it must be considered there a very rare bird. In England, if we except the northern counties, it is of still less frequent occurrence, although specimens have been obtained as far south as Devonshire and Cornwall. With us it is of active habits, but generally shy, and easily put to flight. It is said to feed not only on the berries of the ivy, rowan, whitethorn, and wild rose but also on insects, which it pursues in the same manner as shrikes and fly-catchers, though not with equal dexterity. It is often called the Bohemian *Chatterer*, although a remarkably silent bird. As the black patch on its throat is one of its principal distinctive characteristics, black-throated would be a better specific name than Bohemian. It has no song, except a few low, twittering notes, like those of the red-wing, though still more soft; and while singing, alternately erects and depresses its crest, and so squats in a heap, as to conceal all motion in the throat. This song, which the bystander might imagine to be produced with a painful effort on the part of the bird, continues throughout the year.

THE BOHEMIAN WAX-WING.

We pass now to a third tribe* of Perching Birds; those which have, as their name denotes, cone-like beaks. The more decidedly conical the beak is, the more exclusively does their diet consist of hard seeds and grains; while, when the beak is more elongated, and, though strong, less truly conical, the food consists principally of animal substances.

The first family to be noticed is that of the Larks.†

THE SKYLARK.‡

One of the amusing fancies of rural life is, that he who would know what the lark says must lie down in the fields on his back, when his wish will be gratified by the following stanza:—

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* Conirostres.

† Alaudinæ.

‡ Alauda arvensis.

"Up in the lift we go,
Te-hee, te-hee, te-hee, te-hee!
There's not a shoemaker on the earth
Can make a shoe to me!
Why so, why so, why so?
Because my heel is as long as my toe!"

The length of the toe is a special provision for the bird which builds its nest on the ground as between two clods, or in any little recess it can find, for walking on the grass. It is decidedly the most peculiar feature of the lark's external figure. Generally it has four eggs at a time, but it will breed twice or even thrice in one season.

Mudie justly remarks :—"The song of the lark, besides being a most accessible and delightful subject for common observation, is a very curious one for the physiologist. Every one, in the least conversant with the structure of birds, must be aware that, with them, the organs of intonation and modulation are *inward*, deriving little assistance from the tongue, and none, or next to none, from the mandibles of the bill. The windpipe is the musical organ, and it is often very curiously formed. Birds require that organ less for breathing than other animals having a windpipe and lungs, because of the air-cells and breathing-tubes with which all parts of their bodies, and even the bones, are furnished. But those diffused breathing-organs must act with least freedom when the bird is making the greatest efforts in motion—that is, when ascending or descending; and, in proportion as these cease to act, the trachea is the more required for the purposes of breathing. The sky-lark thus converts the atmosphere into a musical instrument of many stops, and so produces an exceedingly wild and varied song—a song which is, perhaps, not equal either in power or compass, in the single stave, to that of many of the

SKYLARKS.

warblers, but one which is more varied in the whole succession. All birds that sing ascending or descending, have similar power, but the sky-lark has it in a degree superior to every other."

Grahame truly addresses it when he says :—

"Thou, simple bird, dwellest in a home
The humblest; yet thy morning song ascends
Nearest to heaven!"

Mudie has graphically described its serenade, as he says :—"The lark rises, not like most birds, which climb the air upon one slope, by a succession of leaps, as if a heavy body were raised by a succession of efforts, or steps, with pauses between; it twines upward like a vapour, borne lightly on the atmosphere, and yielding to the motions of that as other vapours do. Its course is a spiral, gradually enlarging; and, seen on the side, it is as if it were keeping the boundary of a pillar of ascending smoke, always on the surface of that logarithmic column (or funnel, rather), which is the only figure, on a narrow base, and spreading as it ascends, which satisfies the eye with its stability and self-balancing in the thin and invisible fluid. Nor can it seem otherwise, for it is true to nature. In the case of smoke or vapour, it diffuses itself in the exact proportion as the density, or power of support in the air diminishes; and the lark widens the volutions of its spiral in the very same proportion: of course, it does so only when perfectly free from disturbance or alarm, because either of these is a new element in the cause, and, as such, it must modify the effect. When equally undisturbed, the descent is by a reversal of the same spiral; and, when that is the case, the song is continued during the whole time that the bird is in the air.

"The accordance of the song with the mode of ascent and descent, is also worthy of notice. When the volutions of the spiral are narrow, and the bird changing its attitude rapidly in proportion to the whole quantity of flight, the song is partially suppressed, but it swells as the spiral widens, and sinks as it contracts; so that, though the notes may be the same, it is only when the lark sings poised at the same height, that it sings in a uniform key. It gives a swelling song as it ascends, and a sinking one as it comes down; and even if it take but one wheel in the air, as that wheel always includes an ascent or a descent, it varies the pitch of the song."

Old Chaucer indulges in a beautiful fancy :—

"The merry lark, messenger of day,
Saleweth in her song the morrow gray,
And fiery Phœbus riseth up so bright,
That all the orient laugheth at the sight."

The melody of the lark is peculiarly that of spring. Shakespeare describes this bird as the "herald of the morn," and truly so, as it rises in the air and begins its song before day. Ere the snow-drop, "first pale promise of the year," peeps above the ground, the lark, singly or in pairs, is scattered over the face of the country. Its melody, too, is that of love, for as his mate broods on her nest while the corn is springing,

"Invisible in flecked sky
The lark sends down his minstrelsy:"

but, presently, he descends, still trilling out his carol, gradually sinking on wings which quiver with transport; for his mate is there, for whose sake it was poured forth, and on whom he looked, even while he soared so far aloft. But, having reached to within twenty or thirty yards of the ground, his lay ceases, and, instantly changing his mode of flight, he sweeps obliquely to his home.

And who that was ever charmed with that love-song will not say with Wordsworth :—

"To the last point of vision, and beyond,
Mount, daring warbler! that love-prompted strain
('Twixt thee and thine a never-failing bond)
Thrills not the less the bosom of the plain.
Yet might'st thou seem, proud privilege! to sing
All independent of the leafy spring!

"Leave to the nightingale her shady wood;
A privacy of glorious light is thine;
Whence thou dost pour upon the world a flood
Of harmony, with rapture more divine;
Type of the wise, who soar, but never roam;
True to the kindred points of heaven and home."

Such words, however, cannot be employed in the United States of America; for Wilson tells us that there the lark is mute.

THE SHORE-LARK.*

GREAT is the range of this bird from north to south. Sir James Ross mentions that one was shot near Felix Harbour, and Captain F. P. King brought another from the straits of Magalhaens, discovered by a Portuguese of that name, in the service of Spain, and affording a passage from the Atlantic to the Pacific Ocean, between the island of Terra del Fuego and the mainland of America.

Audubon found it in Labrador, a hilly country of North America, on the east side of Hudson's Bay,

> "Where, under the moon, in mounts of frost,
> Full many a mariner's bones are tost;"

where the ice begins to disappear in May, and, about the middle of June, such hot weather prevails as, at times, to scorch the faces of the hunters.

"Although," says that eloquent naturalist, "in the course of our previous rambles along the coast, and among the numberless islands that guard its shores, I had already seen this lark while breeding, never before that day did I so much enjoy its song, and never, before I reached this singular spot, had I to add to my pleasures that of finding its nest. Here I found the bird in the full perfection of plumage and song, and here I had an opportunity of studying its habits, which I will now endeavour to describe.

THE SHORE-LARK.

"The shore-lark breeds on the high and desolate tracts of Labrador, in the vicinity of the sea. The face of the country appears as if formed of one undulated expanse of granite, covered with mosses and lichens, varying in size and colour, some green, others as white as snow, and others again of every tint, and disposed in large patches or tufts. It is on the latter that this lark places her nest, which is disposed with so much care, while the moss so resembles the bird in its hue, that, unless you almost tread upon her as she sits, she seems to feel secure, and remains unmoved. Should you, however, approach so near, she flutters away, feigning lameness so cunningly, that none but one accustomed to the sight can refrain from pursuing her. The male immediately joins her in mimic wretchedness, uttering a note so soft and plaintive, that it requires a strong stimulus to force the naturalist to rob the poor birds of their treasure.

"The nest around is imbedded in the moss to its edges, which is composed of fine grasses, circularly disposed, and forming a bed about two inches thick, with a lining of grouse feathers, and those of other birds. In the beginning of July the eggs are deposited. They are four or five in number, large, grayish, and covered with numerous pale-blue and brown spots. The young leave the nest before they are able to fly, and follow their parents over the moss, where they are fed about a week. They run nimbly, emit a soft *peep*, and squat closely at the first appearance of danger. If observed and pursued, they open their wings to aid them in their escape, and, separating, make off with great celerity. On such occasions it is difficult to secure more than one of them, unless several persons be present, when each can pursue a bird. The parents all this time are following the enemy overhead, lamenting the danger to which the young are exposed. In several instances the old bird followed us almost to our boat, alighting occasionally on a projecting crag before us, and entreating us, as it were, to restore its offspring."

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* Alauda alpestris.

THE SHORT-TOED LARK.*

THERE is some resemblance between the woodlark and this bird, but its breast is unspotted, and its hind toes and claws are comparatively short, and from this peculiarity it derives its name.

According to Mr. Gould, the top of the head and all the upper parts are of a yellowish or sandy brown, with the centre of each feather darker; the quills and tail are of a dusky brown. The tints of the female are somewhat duller than those of the male. The young during the first autumn have the outer edges of each feather margined with buff.

THE SHORT-TOED LARK.

Large flocks of this bird are seen at Erzeroum, in spring; it is found also in Greece, along the shores of the Mediterranean, and in the southern and central parts of France.

THE MEADOW LARK.†

THIS name has been given to the bird by Latham, but Lewin calls it "The Dusky Lark." It is a native of Europe and America. Its upper surface is gray-brown; the feathers are darker in the centre; the smaller wing-coverts are tipped with white, the chest and flanks are ash-streaked, and the lower part of the body is white.

THE CRESTED LARK.‡

NO bird of this species appears to have been killed in the British Islands. This is remarkable, as it might pass from Calais, where it is very common, at will. Mr. Gould thinks it a much more solitary bird than the sky-lark, to which, in its general aspect, it bears a close resemblance. The crest of the male is generally erect. The female is less than the male, and has not so long a crest. The nest is constructed on the ground. The eggs, four or five in number, are of a pale ashy-brown, spotted with dark brown. The Crested Lark frequently sings as it flies, sometimes soaring to a great height; its song is varied, but inferior to that of the sky-lark.

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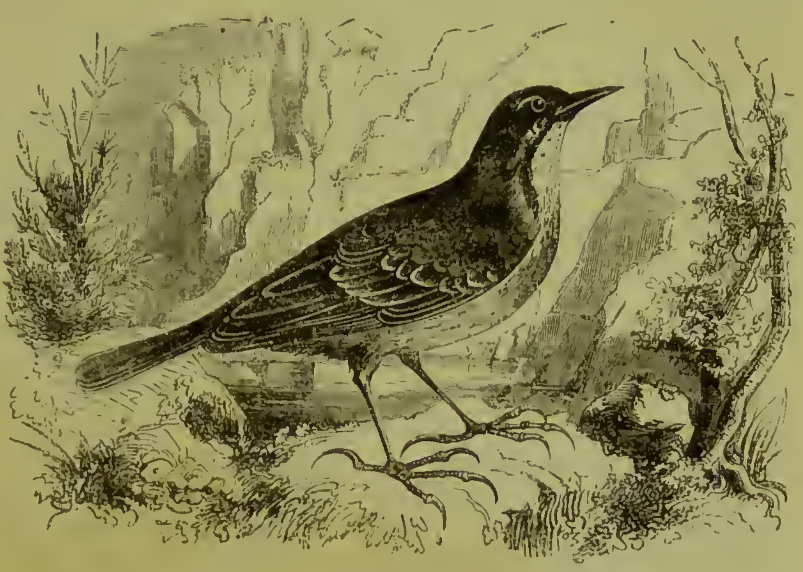
*Alauda brachydactyla. †Alauda spinoletta. ‡ Alauda cristata.

The second genus[*] to be considered is characterised by a rather short, straight, conical bill, and the curved form of the gape, produced by a narrowing of the sides of the upper mandible, and a corresponding enlargement of the under one. Instead of being, as usual, concave within, the upper mandible has a hard rounded knob in the inside, or what is called a tuberculous patch.

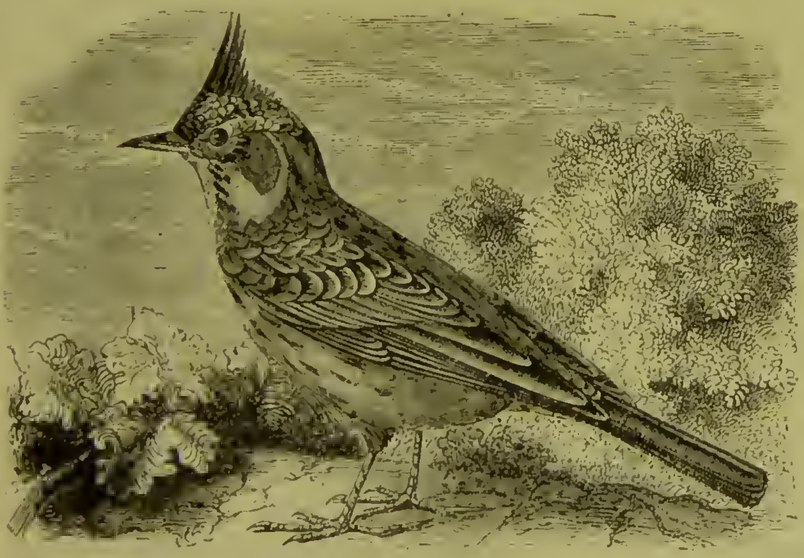
A sub-genus[†] of these birds has been formed by Meyer, and the place of these species is agreed to be between the true larks and the true buntings. While they have several characters allying them to the buntings, the difference in the structure of the wing, their straight hind claw, their terrestrial habits, and their mode of progression on the ground—not by hopping, but by steps—indicate, as Yarrell says, their connection with the larks.



THE MEADOW LARK.

THE LAPLAND BUNTING.[‡]

THE name shows that this bird is a native of the Northern parts of Europe. Pennant says it is found in Siberia, and near the Uralian chain. It inhabits the Faroe Islands, Spitzbergen, Greenland, and Iceland in summer, and from thence westward to Hudson's Bay. Sir J. Richardson says: "I never met this species in the interior of the fur countries during winter, and I suspect that its principal retreats in that season are on the borders of Lakes Huron and Superior, and the country extending to the westward on the same parallel. In the year 1827 it appeared on the plains at Carlton House, about the middle of May, in very large flocks, amongst which were many shore larks (*Alauda alpestris*), and a few individuals of *Plectrophanes picta*. During their stay of ten or twelve days they frequented open spots, where recent fires had destroyed the grass. They came to Cumberland House a few days later in the same season, and there kept constantly in the furrows of a newly-ploughed field. In the preceding year many were seen, though in smaller flocks, in the vicinity of Fort Franklin, latitude 65½°, in the beginning of May; and the crops of those that were then killed were filled with the seeds of *Arbutus Alpina*. They breed in moist meadows, on the shores of the Arctic Sea. The nest, placed on



THE CRESTED LARK.

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[*] Emberiza: Linnæus.

[†] Plectrophanes.

[‡] Plectrophanes Lapponica.

a small hillock, among moss and stones, is composed externally of the dry stems of grass, interwoven to a considerable thickness, and lined very neatly and compactly with deer's hair. The eggs, usually seven, are pale ochre-yellow, spotted with brown."

Little as it might be expected, the Lapland Bunting has been several times taken in this country.

THE SNOW BUNTING.*

This bird, sometimes called the Snow Flake, inhabits, during the breeding season, the Arctic regions and the islands of the Polar Sea. In removing some drift timber, lying on the beach of Cape Parry, Sir J. Richardson found a nest on the ground containing four young snow birds; and Captain Lyon discovered one placed in the bosom of the corpse of an Esquimaux child. The nest is composed of dry grass, neatly lined with deer's hair and a few feathers, and is generally fixed in the crevice of a rock, or in a loose pile of timber or stones. The eggs are greenish-white, with a circle of irregular umber-brown spots round the thick end, and numerous blotches of subdued lavender-purple. Of the young discovered by Sir J. Richardson, he says, "Care was taken not to injure them; and while we were seated at breakfast, at the distance of only two or three feet, the parent birds made frequent visits to their offspring; at first timidly, but at length with the greatest confidence, and every time bringing grubs in their bills."

During the months of December and January the Snow Bunting retires to the southward of the Saskatchewan. It usually reaches that river again about the middle of February; two months afterwards it attains the sixty-fifth parallel of latitude, and in the beginning of May it is found on the coast of the Polar Sea. At this period it feeds on the buds of the *Saxifraga appositifolia*, one of the earliest of the Arctic plants; during winter its crop is generally filled with grass seeds. In the month of October, Wilson found a large flock running over a bed of water plants, and feeding, not only on their seeds, but on the shelly molluscs which adhered to the leaves; and he states that the long hind claws of these birds afford them much support when so engaged. The young are fed with insects.

The Snow Bunting is only a winter visitor to this country, and to the other temperate parts of Europe. Mr. Macgillivray, in a note dated Luachar, in Harris, says: "This bird is frequently met on the hills in small flocks. I am told they are never seen in summer, nor have I ever met with them there beyond the end of April; yet the little flocks which I have often observed were apparently family groups. Nor do these birds appear in large congregations, such as we often see along the shores of Scotland or England. On the 4th of August, 1830, being on the summit of Ben-na-muic-dui, the highest mountain in Scotland, I observed a beautiful male flitting about in the neighbourhood of a great patch of snow; it was also seen by Dr. Greville at the same place. Some days after, having descended from the top of Lochnagar, to its corry, along with Dr. Martin Barry, in quest of plants, I met with a flock of eight individuals, flying about among the blocks of granite. They were evidently a family, the male and female being easily distinguishable from the young. It is, therefore, very probable that the Snow Flake breeds on the higher Grampians, and perhaps in considerable numbers, although it is not likely that the vast flocks seen on the lower grounds in winter are exclusively of Scottish origin."

Mr. Knapp states that "out of nearly forty which were captured by one bird-catcher during a single winter on the downs near Brighton, only two had the white head characteristic of the adult snow bunting." Mr. Foljambe, an excellent ornithologist, wrote also to his friend Colonel Montagu: "A few years ago I shot forty from the same flock, during severe weather in the month of January, hardly any two of which exhibited precisely the same plumage, but varied from the perfect tawny to the snow bunting in its whitest state; the feathers of those of the intermediate state being more or less charged with white."

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* Plectrophanes nivalis.

THE COMMON BUNTING.*

Of frequent occurrence in many of our cultivated districts, and remaining in the country throughout the year, this is really a common bird. As it is often seen about corn-fields, one of its provincial names is that of Corn Bunting, by which, too, it is also known in Scotland. Not so elegant in form or so gay in its plumage as the yellow ammer, it is a larger, and appears to be a hardier bird.

The centres of the feathers on the whole upper part are blackish-brown, margined with olive colour on the body, and yellowish-brown on the coverts and quills. The tail is dusky, less produced and more forked than that of the yellow bunting. The bill, which is very conical, and has the palatial knob large, is of a bluish-black on the upper ridge, while the rest is straw colour. The colours of the female differ little from those of the male, but the general tint of both is various, being in some instances nearly black, and in others inclining to gray.

THE COMMON BUNTING.

The nest, usually placed on or very near the ground, is often sustained a few inches above it by the strong, coarse herbage or tangled briers amidst which it is concealed. It is composed of straw and fibrous roots, mixed with dry grass, and lined with hair. There are four or five eggs, of a reddish-white, or pale purple-red ground, streaked and spotted with dark purple-brown. "The adult birds," says Yarrell, "feed principally on grain and seeds, for the breaking down or shelling of which the palatial knob of the upper mandible, and the elevated cutting edges of the lower one, are admirably adapted."

Mr. Knapp remarks: "It could hardly be supposed that this bird, not larger than a lark, is capable of doing serious injury; yet I this morning witnessed a rick of barley, standing in a detached field, entirely stripped of its thatching, which this bunting effected by seizing the end of the straw and deliberately drawing it out, to search for any grain the ear might contain."

THE YELLOW BUNTING, OR YELLOW AMMER.†

This is a beautiful little bird, which may be seen darting in spring and summer from the hedges, bushes, and copses it frequents, loving, as it does, the richer parts of the country.

The fine lemon-yellow colour of the male's head and breast, and the rich chestnut and brown of the back, invest him, indeed, with a brilliant plumage. But to this his song is not equal, attracting no

[*] Emberiza miliaria.

[†] Emberiza citrinella.

human ear; while so common is this beautiful bird, being indigenous to England, Wales, Ireland, and Scotland, as often to be unnoticed when flying from one low tree to another, or from bush to bush, as the pedestrian proceeds on his way. The head of the female has much less yellow, and her general colour is inferior in vividness to that of the male.

THE YELLOW AMMER.

THE BLACK-HEADED BUNTING.*

This bird, often called the Reed Bunting, is about the size of the yellow ammer. Its nest is generally placed in a tuft or under a low bush, and when reeds are selected, it is made where they form a dry tuft or yield other support. The eggs are of a grayish white, with a tinge of pale pink, lined and dropped with chocolate red.

Mr. Neville Wood mentions a pleasing instance of this bird's sagacity:—"Some years ago, when walking with a friend, I remember seeing two black-headed buntings in an osier bed, the male perched erect at the summit of a willow stem, and his mate remaining beneath, or only occasionally coming within view. On our entering the osiers, they both flew around us in great alarm, mostly in silence, but sometimes uttering a low, mournful kind of note, at the same time darting suddenly about the hedge and willow stems, as if impatient for our immediate departure; and their manners were so different from those commonly observed in the species, that we were convinced that there must be a nest thereabouts. I was well aware of the difficulty of finding its little tenement in a situation of that kind, and accordingly we both of us began to move in different directions, in order to discover by the actions of the birds where their treasure lay.

"My friend traversed one side of the osier bed, and myself the other; but still the loving and faithful couple remained in precisely the same spot, where the junction of two hedge-rows formed a corner, and we therefore concluded, naturally enough, that in that spot all their hopes were centered. But a close and minute investigation of the whole corner, during which we laid the ground completely bare, revealed nothing to us. At length, a full hour after the commencement of our labours, I hit upon the nest by mere chance, at exactly the opposite end to that at which the reed buntings had been, and still were, prosecuting their whinings and manœuvres, which now proved beyond a doubt, what I had never before suspected, that the birds had been all the time endeavouring to attract our attention towards them, instead of towards the nest."

The male bird, no less than the female, tries to allure intruders from the little domicile. Mr. Salmon, of Thetford, tells the following tale in reference to the latter:—"Walking in spring in some rushes near a river, my attention was arrested by observing a black-headed bunting shuffling through the rushes, and trailing along the ground, as if one of her legs or wings was broken. I followed her to see the result, and she, having led me to some considerable distance, took wing, no doubt much rejoiced, on returning, to find her stratagem had been successful in preserving her young brood, although not in preventing the discovery of her nest, containing five young ones, which I found was placed, as usual, on the side of a hassock, or clump of grass, almost screened from view by overhanging dead grass. I have invariably found it in such a situation, and never suspended between reeds, as is sometimes stated; it was composed of dead grass, and lined sparingly with hair."

This bird, with its black head pleasingly contrasted with its white neck-collar, and the varied colours of the back, remains in this country during the year. It dwells in marshy places, the sides of lakes and large ponds, banks of rivers or canals, beds of osiers, and rush-grown water-meadows. In suitable localities, the male may be observed, during the breeding season, perched on some conspicuous spray, and for an hour together, cheering his mate, and doubtless gratifying himself, with his simple song.

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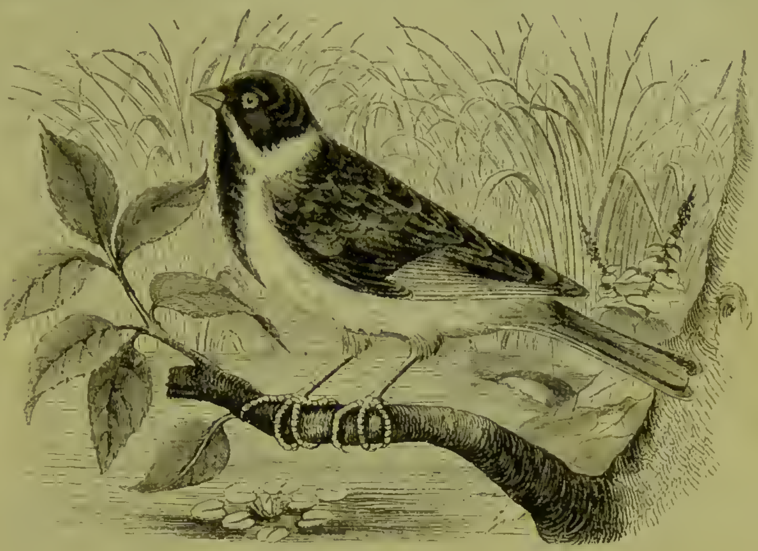
* Emberiza schœniclus.


THE BLACK-HEADED BUNTING.

This bird is found in all the southern counties of England, where the localities are suited to its habits, and so it may be said of Scotland, Ireland, and Wales.

THE CIRL BUNTING.*

These birds are rather smaller than the yellow ammers, their colours are more varied, but there is a resemblance in their manners, and they freely associate together. The voice, too, is more agreeable, and the chirp of the female is very soft.

Colonel Montagu was the first to discover the Cirl Bunting to be a British bird. He soon found its nest, which is generally built in furze or some low bush. A little moss and some dry stalks compose its nest, which is lined with long hair and fibrous roots. There are four or five eggs, of a dull white, tinged with blue, streaked and speckled with dark liver-brown. The young are hatched in thirteen or fourteen days, and are supplied with insects by the parent birds. Colonel Montagu found grasshoppers most serviceable, with uncooked meat, finely divided, when they were reared by hand.

THE CIRL BUNTING.

THE COW BUNTING.†

This bird, a native of America, is of a violet black; its head and neck are gray-brown. It lives in flocks near cattle; hence its name; but the most remarkable trait in its habits is, that, like the cuckoo, it deposits its eggs in strange nests, as in that of the blue-eyed warbler.

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* Emberiza cirlus.

† Emberiza pecoris.

"When," says Nuttall, "the female is disposed to lay, she appears restless and dejected, and separates from the unregarding flock. Stealing through woods and thickets, she pries into the bushes and branches for the nest that suits her, into which she darts in the absence of the owner, and in a few minutes is seen to rise on the wing, cheerful and relieved from the anxiety that oppressed her, and proceeds back to the flock she had so reluctantly forsaken. If the egg be deposited in the nest alone, it is uniformly forsaken; but if the nursing parent have any of her own, she immediately begins to sit. The red-eyed fly-catcher, in whose beautiful basket-like nests I have observed these eggs, proves a very affectionate and assiduous mother to the uncouth foundling. In one of these I found an egg of each bird, and the hen already sitting. I took her own egg, and left the strange one. She soon returned, and, as if sensible of what had happened, looked with steadfast attention, and shifted the egg about, then sat upon it, but soon moved off; again renewed her observation; and it was a considerable time before she seemed willing to take her seat; but at length I left her on the nest. Two or three days after, I found that she had relinquished her attention to the strange egg, and had forsaken the premises. Another of these birds, however, forsook the nest on taking out the cow-bird's egg, although she had still two of her own left. The only example, perhaps, to the contrary, of deserting the nest when solely occupied by the stray egg, is in the blue-bird, who, attached strongly to the breeding places, in which it often continues for several years, has been known to lay, though with apparent reluctance after the deposition of the cow-bird's egg."

MALE AND FEMALE COW BUNTING OCCUPYING THE NEST OF THE BLUE-EYED WARBLER.*

The third and varied family of the Cone-Beaked birds is commonly known by the name of the Finches.† Among these is a bird with which all are acquainted.

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[*] Sylvia æstiva: Latham.

[†] Fringillidæ.

THE HOUSE SPARROW.*

The dingy bird of a London square is but a poor representative of the tribe of sparrows so familiar in every country spot, and for which Barry Cornwall thus pathetically pleads :—

"Touch not the little sparrow who doth build
His home so near us. He doth follow us
From spot to spot, amidst the turbulent town,
And ne'er deserts us. To all other birds
The woods suffice, the rivers, the sweet fields,
And nature in her aspect mute and fair;
But he doth herd with man. Blithe servant! live,
Feed and grow cheerful! On my window's ledge
I'll leave thee every morning some fit food,
In payment of thy service. Doth he serve?
Aye, serves and teaches. His familiar voice,
His look of love, his sure fidelity,
Bid us be gentle with so small a friend;
And much we learn from acts of gentleness.
Doth he not teach? Aye, and doth serve us too,
Who clears our homes from many a toilsome thing,
Insect or reptile; and when we do mark
With what nice care he builds his nest, and guards
His offspring from all harm, and how he goes,
A persevering, bold adventurer,
'Midst hostile tribes, twenty times as big as he,
Skill, perseverance, courage, parent's love,—
In our own lives, perhaps, when need doth ask,
To imitate the little household bird.
Untiring follower! what doth chain thee here?
What bonds 'tween thee and man? Thy food the same
As theirs who wing the woods,—thy voice as wild,
Thy wants, thy power, the same; we nothing do
To serve thee, and few love thee; yet thou hang'st
About our dwellings, like some humble friend,
Whom custom and kind thoughts do link to us,
And no neglect can banish."

"We have scarcely," says Mr. Knapp, "another bird the appetite of which is so accommodating in all respects as that of the house sparrow. It is, I believe, the only bird that is a voluntary inhabitant with man, lives in his society, and is his constant attendant, following him wherever he fixes his residence. It becomes immediately an inhabitant of the new farm-house, in a lonely place or recent inclosure, or even in an island; will accompany him in the crowded city, and build and feed there in content, unmindful of noise, the smoke of the furnace, or the steam-engine, where even the swallow and the martin, that flock around him in the country, are scared by the tumult and leave him; but the sparrow, though begrimed with soot, does not forsake him; feeds on his food, rice, potatoes, and almost any other extraneous substance he may find in the street; looks to him for his support, and is maintained almost entirely by the industry and providence of man. It is not known in a solitary and independent state."

THE HOUSE SPARROW.

Like most prolific birds, sparrows contend violently for choice or possession. Nor is this done singly, for five or six birds may be seen attacking, buffeting, and biting each other with the utmost rage; but on some ground, mutually satisfactory, perhaps, the battle at length comes to an end, and the combatants engage in their other affairs.

Their nests are found under the eaves of tiles, in holes or crevices in walls, in the orifices of old water pipes, or in any cavity where the collected hay and feathers may be properly placed. Sometimes

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[*] Fringilla domestica. Passer domesticus.

they build among the higher branches of apple or plum trees in a garden; sometimes in other trees, but seldom choosing one that is far from a house. The nest, formed with a dome, is composed of a mass of hay, lined with numerous feathers, and allowing entrance by a hole in the side; it is very large as compared with the bird. The eggs are white, spotted and streaked with ash colour and dusky-brown.

As Mr. Broderip was passing one day along the footway that borders the National Gallery, he saw a sparrow fly down to the neighbouring hackney-carriage stand and pick up a very long straw, with which it flew, with some labour, towards the building. The long, streaming straw attracted the attention of some of the pedestrians, who stopped and looked at the little loaded bird, who was directing its flight toward the portico of the gallery; but, finding its motions watched, it turned short round and pitched with its straw on one of the window-sills, and the people then passed on. Presently it flew again towards the portico; but, the people again stopping and looking—for if one passenger stops and looks up in a great London thoroughfare, you have in a very few moments an increasing crowd—it flew back to another window, and the second lot of gazers went their way. The little bird then started again with its straw towards one of the same pillars, and, cutting round it, so as to avoid prying eyes as much as possible, bore it to the capital of one of the pilasters and disappeared, straw and all, into the snug nook, made by a part of the projecting ornament, which it had chosen as the place for building its nest. "The wary bird," adds Mr. Broderip, "was not disposed to let an inquisitive public know the way to its home. On many other occasions I have observed these and other birds remain waiting about for a long time with nest-materials and food in their bills, when they have perceived that I was watching them; but the moment I turned my head, they were off with their burden to the nest. This would not be worth mentioning, were it not so difficult to find persons who will use their eyes to some purpose."

Again, in the words of Barry Cornwall, we say:—

"So, long live
The household sparrow! may he thrive for ever!
For ever twitter forth his morning song,
A brief, but sweet domestic melody!
Long may he live! and he who aims to kill
Our small companion, let him think how he
Would feel, if great men spurned him from their hearths,
Or tyrant doom'd him, who had done no wrong,
To pains or sudden death. Then let him think,
And he will spare this little trustful bird;
And his one act of clemency will teach
His heart a lesson that shall widen it;
For nothing makes so bright the soul, as when
Pity doth temper wisdom."

Kindly wishes for this bird, however, like others for very different objects, are not always realised; of which the following fact is a proof:—The principal external ornament of the Rotunda, in Sackville Street, Dublin, is a richly-carved frieze, representing the heads of oxen, with festoons of flowers pendant from the horns; the frieze running round the entire building at a great elevation. In the hollow of the eye of one of these heads a sparrow built its nest. But amongst the materials it employed for that purpose, there unhappily chanced to be a woollen thread, with a noose at one end. By some accident the poor little bird got his own neck inserted in the noose, and in his efforts to extricate himself fell from his nest, and hung suspended below it. He was observed for some time making prodigious efforts to escape, but in vain; and his remains were unhappily to be seen gibbeted at his own door, and fluttering in the wind, whilst the straws of his nest projected from the eye-hole above his head.

THE TREE SPARROW.*

This is an active, lively bird, often taken for the house sparrow, which it resembles in appearance and many of its peculiarities. It is, however, more local in distribution and less numerous as a species, but in various countries small colonies of them may be found. On the Continent it abounds in Holland and France, and it extends its range southwards to Spain and Italy.

The Tree Sparrow is shorter than the common sparrow, and perches with the axis of its body more erect. The top of its head and nape are dark reddish-brown, the black of the chin less in proportion; there is a conspicuous black patch on the ear coverts; the sides of the neck and breast are white, the white being produced till it forms a narrow collar round the neck; there is a bar on the closed wing, white with black spots on the anterior edge; and there are two white bars on the expanded wings. The female is more similar in colour to the male than is that of the house sparrow.

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* Passer montanus. Fringilla montana.

These birds frequently build in the thatch of a barn, in company with the house sparrow, not, however, entering the thatch, like that bird, from the inside of the building, but from the outside. They build, too, in other places, and even in the deserted abodes of magpies and crows. Their nests are formed of hay, and lined with feathers. The eggs, from four to six in number, are of a dull-white, speckled all over with light ash-brown. The young are supplied with insects and soft vegetables, which are the principal food of the old birds during spring and summer; at other times of the year they feed on grain and seeds.

In America the migrations of these birds are made on an extensive scale. Wilson tells us, "They extend from the arctic circle, and probably beyond it, to the shores of the Gulf of Mexico, spreading over the whole breadth of the United States, from the Atlantic Ocean to Louisiana; how much farther I am unable to say.

"About the 20th of October they make their first appearance in those parts of Pennsylvania east of the Alleghany mountains. At first they are most generally seen on the borders of woods, among the fallen and decayed leaves, in loose flocks of thirty or forty together, always taking to the trees when disturbed. As the winter sets in colder, they approach near the farm-houses and villages; and, on the appearance of what is usually called falling weather, assemble in larger flocks, and seem doubly diligent in searching for food: this increased activity is generally the sure prognostic of a storm.

THE TREE SPARROW.

"When deep snow covers the ground, they become almost half domesticated; they collect about the barns, stables, and other out-houses, spread over the ground, and even round the steps of the door, not only in the country and villages, but in the midst of our large cities, crowding round the threshhold early in the morning, gleaning up the crumbs, and appearing very lively and familiar. They have also recourse at this severe season, when the face of the earth is shut up from them, to the seeds of many kinds of weeds that still rise above the snow in corners of fields and low, sheltered situations." They may now be seen associated with several species of their congeners, all engaged in the same assiduous search for food. The nest of these birds is said to be placed on the ground among the grass, several being clustered together within a little distance of each other.

THE GOLDFINCH.*

No wonder that one of our poets should address this bird in kindly and animated terms:—

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* Carduelis elegans.

"Goldfinch, pride of woodland glade,
In thy jet and gold arrayed;
Gentle bird, that lov'st to feed
On the thistle's downy seed;
Freely frolic, lightly sing,
In the sunbeam spread thy wing!
Spread thy plumage, trim and gay,
Glittering in the noontide ray!
As upon the thorn-tree's stem
Perch'd thou sipp'st the dewy gem.
Fickle bird, for ever roving,
Endless changes ever loving;
Now in orchards gaily sporting,
Now in flowery fields resorting;
Chasing now the thistle's down,
By the gentle zephyr blown;
Lightly on thou wing'st thy way,
Always happy, always gay."

The pleasing form, gay attire, lively habits, cheerful song, and strong disposition to personal attachment, render this one of the most favourite cage-birds. Well, too, do the goldfinches bear confinement; living, as they have done, ten years in captivity, and singing the greater part of each year.

THE GOLDFINCH.

It has been truly said:—

"The goldfinch weaves with willow down inlaid,
And Cannach tufts, his wonderful abode;
Sometimes suspended at the timber end
Of plane-tree spray among the broad-leaved shoots,
The tiny hammock swings to every gale;
Sometimes in closest thickets 'tis concealed,
Sometimes in hedge luxuriant, where the briar,
The bramble, and the plum-tree branch:
Warp through the thorn, surmounted by the flowers
Of climbing vetch and honeysuckle wild."

The flight of the goldfinch is straightforward and smooth, without any undulations or jerks, though it never flies at any great elevation above the ground. The tits have a sort of irritable expression which this bird has not; yet, from its strength, its sharply-pointed bill, and its power of wing, few birds of its size can combat with it on equal terms. In the air, however, such combats are few, excepting those of the males in pairing time. The goldfinch is very generally distributed over Britain, wherever the nature of the soil is such as to afford it a supply of food, in the early season, when the first broods are hatched.

The Sieur Roman, some years ago, had an exhibition of goldfinches and linnets wonderfully trained. One appeared dead, and was held up by the tail or claw, without exhibiting any signs of life. This, however, was by no means a solitary instance. The writer well remembers a man who used to stand from day to day in the shadow of the high wall of Burlington House, Piccadilly, to sell goldfinches that would perform this feat, and did so frequently for the attraction of purchasers. A second bird of the Sieur Roman stood on its head, with its claws in the air; a third imitated a Dutch milkmaid going to market, with pails on its shoulders; a fourth imitated a Venetian girl looking out of window; a fifth, appearing as a soldier, mounted guard as a sentinel; the sixth acted as a cannoneer, with a cap on its head, a firelock on its shoulder, and a match in its claw, with which it discharged a small cannon. The same bird also acted as if it had been wounded. It was wheeled in a barrow, as if to convey it to an hospital; after which it flew away before the company. The seventh turned a kind of windmill; and the last bird stood in the midst of some fireworks which were discharged all round it, without its exhibiting the slightest symptom of fear.

The writer saw the exhibition of Mademoiselle Vandermeersch's trained birds, a few years ago, at Willis's Rooms; there were canaries, goldfinches, bullfinches, and other birds, all evidently fond of their mistress, and ready to perform at her will many curious feats with numbers and letters, printed on cards.

THE MOUNTAIN FINCH.*

The feathers of the head and throat of this bird are bright black, with a border of dark reddish yellow, which becomes less marked as the bird advances in age. The belly is mottled with white; the feathers of the back are black, with a broad margin of dark yellow. The top of the neck and breast, as well as the lesser wing coverts, are orange; the larger wing coverts are black, tipped with white. The tail is somewhat forked and black. The colours of the female are less diversified.

THE MOUNTAIN FINCH.

This bird is common throughout Europe, but in summer chiefly inhabits the extreme north. In spring, autumn, and winter, it may be found in all the German forests, and has been seen in immense flocks in Thuringia, in seasons when beechmast was abundant.

THE POY BIRD.

This curious bird was noticed by Captain Cook on his visit to Tahiti. The feathers are of a fine mazarine blue, except those of its neck, which are of a beautiful silver gray, and two or three short white ones, which are on the pinion-joint of the wing. Under its throat hang two little tufts of curled snow-white feathers, called its *poies*—the Tahitian name for ear-rings, which led to that name being given to the bird. The song of this bird is very sweet.

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* Fringilla montifringilla.

THE COMMON LINNET.*

> "Within the bush, her covert nest
> A little linnet fondly prest;
> The dew sat chilly on her breast,
> Sae early in the morning."

So said Burns. Various are the names given to this bird, by different ornithologists. Among these are the Red-headed Finch, the Linnet Finch, the Brown Linnet, and the Greater Redpole; the French call it *Gros-bec Linotte.*

It was long supposed that there were two species included under this name, but it has since been found that the same bird passes through seasonal changes, and thus has a summer and a winter plumage. Its name is traced, as Yarrell states, to the fondness of the linnets for the seeds of the various species of flax—*linum, linaria, linota, la linotte,* linnet.

This linnet is very common in Britain, and extends as far as the Orkneys, where it is abundant. During the summer it resorts to waste land and commons, in the upper parts of the country, where it breeds. Furzy commons seem to be the favourite resorts of these birds during that season, the bushy furze being admirably adapted to conceal the nest from the prying eye, and sometimes a quickset or gooseberry bush answers the purpose. The nest is composed of moss, woven with wool, and lined with wool and hair, very neatly put together; there are four eggs, of a bluish white, with a few purplish specks and short lines. If the nest should be destroyed, they will build another as late as the month of August, as if dissatisfied until the object of their visit is accomplished.

THE POY BIRD.

Selby states that he repeatedly verified the fact of this linnet never acquiring in confinement the brilliant tints which distinguish it at a particular season of the year, when it is at liberty. "For some purpose of observation," he says, "a linnet was shot, towards the close of summer, when the plumage showed its most perfect nuptial tint, and, happening to be only winged, was put into a cage. It soon became familiarised to its situation, and still continues so. About the usual time in the autumn of that year it moulted, and acquired the winter dress of the common linnet, which it has retained ever since, without displaying, at the accustomed season, any of the brilliant red that adorned it in the wild state."

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* Linota cannabina.

Bechstein sustains this statement, and says that young birds bred in the cage never acquire the crimson colour on the head and breast, and that old birds, at the first moulting after their captivity, lose their beautiful colours, which never return.

During the time of nidification, and until the young are hatched, the song of the linnet, though short, possesses much sweetness. "At once brilliant and soft," says Bechstein, "it consists of many irregular notes, tastefully put together in a clear and sonorous tone, which continues during the whole year, except at the moulting season. Besides its own natural note, it will soon acquire the notes of other birds, particularly the nightingale; and may be taught in a very short time to imitate any of our tunes, if they are whistled to it."

That ingenious and genial writer, Mr. Mogridge, so well known throughout Great Britain and America as "Old Humphrey," tells an amusing and suggestive story of his pet linnet. He thus meets an objection at the outset: "But, perhaps, it may be said, 'You, who talk so glibly of kindness to dumb creatures, and prate with your pen so freely about humanity; you to keep a bird pent up in a narrow cage!' He was not, gentle reader, he was not always mine. I took care of him for another, until he became legally, really, and truly my own bird. He who left him with me would not take him away again, believing that he could not make him so comfortable and happy as I did. And then, again, so far from being pent up in a narrow cage, he has the door of his wiry habitation open almost the whole of the day when in the house, going out and in as he pleases, to say nothing of the free revel he now and then has on the beds and gravel walks of the garden. If old Chuffy could speak for himself, he would not complain of his master, I know:

THE COMMON LINNET.

"I love my bird, and when I give
His measure free
Of meat and drink, I try to think
That he loves me.

"I know Chuffy must be ten or twelve years old, and for this very sufficient reason, that for so long a period he has been under my care. Twelve months ago, about the time when I sprained my ankle, one of his legs having caught in the wire of his cage, his thigh was put out of joint, so that we have been fellow-sufferers. You may be sure I do not value him the less on this account. As he is now pecking at the mould of the flower-pot before me, I may as well draw his picture.

"When old Chuffy was young, his plumage was ruddy; but now it has lost much of its warmth of colouring. His back is light brown, mixed, blotched, mottled, or streaked (for I hardly know which) with darker brown. His breast and the quills of his feathers are lighter; his legs and claws of a flesh-colour, and when the sun shines on them they look transparent. One of his wings is a little rueful, for it does not sit close to his body, and his poor lame leg sticks out in a rather unsightly manner. Hardly has he any tail; his blue beak is strong, pointed, and sharp; and his eye is black as ebony, and almost as bright as a diamond.

"Though old Chuffy seems to lead the life of a pensioner on my bounty, I feel quite sure that if I were to keep a debtor and creditor account with him, the balance would be sadly against me. I give him rape, flax, and now and then a little hemp-seed; and occasionally he has water-cress, chickweed, and groundsel, besides water to drink and to wash in. He lives in his cage rent free, pays no taxes, and I charge him nothing for attendance. This is a tolerably fair statement of what I do for poor old Chuffy. But does Chuffy do nothing for me? Oh, yes, indeed he does. Why, the hopping about his cage is worth something; his very chirp is cheerfulness, and his song is melody.

"Old Chuffy gives me a useful lesson, and sets me an example of cheerfulness and thankfulness worth my closest imitation; for without hands, clothes, or books, pen, ink, or paper, he can be happy. He has neither a purse, nor a pocket to put it in, if he had one; nor has he, as I have, the gift of speech, or the still greater gift of reason and understanding; and yet, give him the range of a few flower-pots within doors, or hang him up in the sun without, and he will make the neighbourhood ring again with his note.

"Sometimes I talk jocosely to Chuffy on this wise, fancifully putting such words into his mouth as I suppose he would use had he the gift of speech, and was conversing with me.

"'Chuffy,' I say to him, 'you are not an eagle, winging your flight upwards towards the sun; but a poor caged linnet, with a lame leg; so you must not give yourself airs.'

"Chuffy chirps his reply, which is to this effect: 'I know that I am not an eagle; but if that is a fault, it is not mine; and if I am a poor caged linnet with a lame leg, I have more need of your pity than your reproach.'

"This reply is just what it ought to be; but Chuffy has not done with me yet, for he goes on thus with his chirping: 'If I am not a king among birds, neither are you a king among men. True, my leg is lame, but yours is little better, for a sad hobble you make of it, either when walking without a stick or with one. You can hardly, I think, blame me without reproaching yourself.'

"While I am noting down these remarks, old Chuffy is sitting at the opened door of his cage, placed on the table before me, pulling away at a great bunch of grass, groundsel, and chickweed, so close to him that he seems to be almost in the middle of it. Linnets are seen in the lanes and the fields; but they like better to frequent the wild broken ground of the common, and get among the furze-bushes; and if I thought that Chuffy could live there, and be happier than he is now, he should be among them to-morrow. But he could never get his own living now; a cat, a weasel, or a hawk, would be sure to lay hold of him.

"Should any reader churlishly say that what I have written is trifling, my reply is, that as nothing can be altogether trifling and unworthy which makes me feel more kindly to my poor injured and aged bird, and that may influence others to practise more humanity to theirs, it is my intention to amuse myself, and even to continue my playful conversations with my feathered pet. I do not, however, really believe that any reader is opposed to me, either as it regards my principle or my practice. Humanity is a precious jewel, which ought to be worn in every bosom; nor are the lower creatures too insignificant to be treated with kindness. God careth for oxen; his tender mercies are over all his works, and without his permission not a sparrow falleth to the ground."

THE MOUNTAIN LINNET.*

THIS bird, also called the Twite and the Twite Finch, and by the French, *Gros-bec de Montagne*, has a longer tail than either the common or the red-pole linnets. It has also a reddish tawny throat, but has no red colour on the breast. A tinge of red appears, however, on the rump of the male in summer, and the general plumage of both sexes greatly resembles that of the other species of the genus.

The Mountain Linnet, as its name implies, prefers an interchange of moor and fell. It breeds in the northern parts of England, in Scotland, and in the western as well as the northern Scottish islands, every season; but it is a winter visitor only to the southern parts of England, where it is generally seen in small flocks, with other linnets.

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* Linota montium.

Mr. Macgillivray states that this bird "is plentiful in the Hebrides, and in winter frequents the corn-yards in large flocks, clinging to the stacks of oats, and picking out the seeds. Its flight is rapid and undulated, and it whirls over the fields previous to alighting, uttering a soft twitter at intervals. When disturbed, it betakes itself to small trees, or to a distant field; but is not shy, and may, therefore, be easily approached when feeding. In spring it forsakes its winter haunts, and disperses over the hilly tracks, where it forms its nest on the ground, among short heath, or on the grassy slopes of craggy spots. It is neatly constructed, being composed externally of fine dry grass, fragments of heath, and a little moss; internally of fibrous roots, wool, and hair. The eggs are bluish white, marked towards the larger end with light brown and purplish red, sometimes with a few blackish dots."

THE LESSER REDPOLE.*

This species is very generally diffused throughout Europe, but the northern parts seem to be its native regions. It is not uncommon in the southern counties of England during the winter months; at this season it is gregarious, and numbers are frequently taken about London and other parts by birdcatchers.

THE MEALY REDPOLE.

"It is a bird," says Bechstein, "more pleasing to the eye than the ear; its warble being feeble and weak, and consisting of a continued chinking note. It is impossible to see without pleasure the affection which seems to exist between the male and female of this species, who fondle and caress each other without ceasing. They will do the same even with the goldfinch, linnet, and canary, with any of which it will readily pair."

According to Mr. Selby, this bird returns, during the summer, to the underwood that covers the bases of our mountains and hills, and that often fringes the banks of our precipitous streams, in which sequestered situation it breeds. The nest is built in a bush or low tree, such as the willow, alder, or hazel, of moss and the stalks of dry grass, intermixed with down from the catkin of the willow, which also forms the lining, and renders it a particularly soft and warm receptacle for the eggs and young. From this substance being a constant material of the nest, it follows that the young are produced late in the season, and are seldom able to fly before the end of June or the beginning of July. The eggs are four or five in number; the colour pale bluish-green, and spotted with orange-brown, principally towards the larger end.

THE MEALY REDPOLE.†

Mr. Gould says:—"Whether this species is truly a native of Europe, or whether those which occur in our island are arrivals from the northern portions of the American continent, is a matter of doubt;

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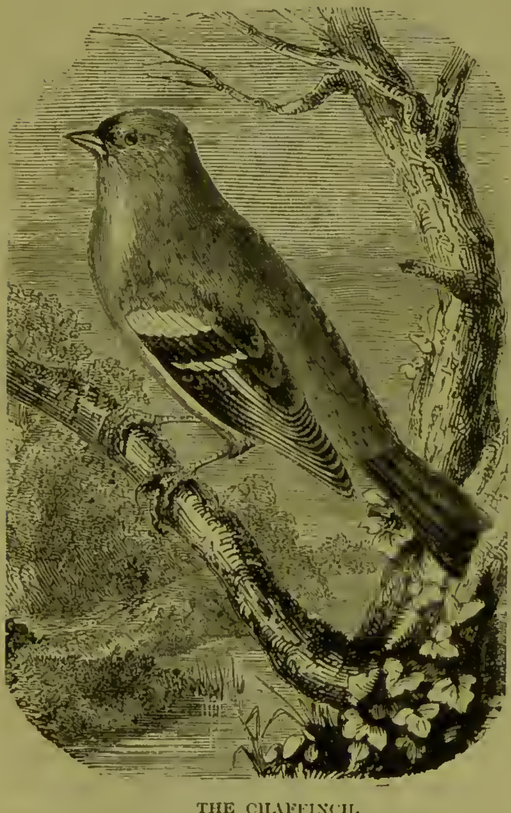
* Fringilla flavirostris: Linnæus.

† Linota canescens.

true it is, that the specimens brought home by Dr. Richardson, which furnished the descriptions given in the 'Fauna Boreali-Americana,' are strictly identical with the bird before us."

THE CHAFFINCH.*

This delightful songster of spring, famed for the sprightliness of its warbling—this favourite bird of most of our bird-fanciers, is generally known. The passion for this bird is carried to such an extent in Thuringia, and those which sing well are so much sought after, that scarcely a single chaffinch that warbles tolerably can be found throughout the province. As soon as one arrives from the neighbouring country, whose notes appear good, all the bird-catchers seek it, and do not give up the pursuit until they have taken it. This is the reason why the chaffinches in this province are such indifferent songsters: the young ones have only bad masters in the old ones, and they, in their turn, cannot prove better.



THE CHAFFINCH.

This bird is six inches and one-third in length, of which the tail measures two and three-quarters. The beak is conical, pointed, and white in winter; but as soon as spring, the season of pairing and song, arrives, and till the time of moulting, it is of a deep blue; and one may know by this whether it has sung or not. The iris is chesnut-brown; the legs, nine lines high, are dusky; the claws are very sharp, and grow so fast in a cage, that it is necessary to cut them every six weeks, if it is not wished to see the poor bird some day caught by them, and perish miserably unless rescued. The forehead is black, the top of the head and nape of the neck are grayish-blue; in very old males deep blue, and then thick downy hairs are perceived; the back and rump are a linnet-green, the upper part chesnut with an olive tint; the cheeks, throat, breast, and all the under part of the body, in fact, are of a reddish chesnut-brown, which becomes white towards the extremity; the thighs gray; the quill-feathers black-edged, with white on the outer side; the lesser wing-coverts white, the greater black, with the tips white, which form two white lines on the top of the wings; the tail feathers black, with a gray tint on the two middle ones, and a large wedge-shaped white spot on the two outer; the third is sometimes marked with a small spot; all are slightly green on the edges. After moulting, at the beginning of winter, the colours become lighter; the front of the head only is deep brown; the top and the nape of the neck a changeable grayish and olive-brown; the red-brown of the breast is brighter: this is also the plumage of the young ones in the second year, particularly if of the last brood; they are called gray-heads by bird-catchers, who can easily distinguish, in the spring, the young from the old males, and very much prefer them, because, if properly caught, they may be taught to improve their song when confined in the house; whilst the others never learn, or change very little, at least rarely, the song they have acquired in their wild state.

The female is very different, being smaller, while the head, neck, and upper part of the back are grayish-brown, and all the under part of the body is a dusky white, rather reddish-gray on the breast; and the beak, grayish-brown in spring, becomes grayish-white in winter.

There are some remarkable varieties of this species; one quite white; another with a white collar; a third streaked, or spotted. There is no distinction between the wood chaffinches and those of the gardens and orchards, as has been alleged.

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* Fringilla Cœlebs.

The nest of the chaffinch is one of the most beautiful of birds' nests, and formed in the most skilful manner. It is the shape of a half-globe flattened on the upper part, and so perfectly rounded that it has the appearance of having been turned in a lathe. Cobwebs and wool fasten it to the branch, bits of moss with small twigs entwined form the ground-work; the lining is composed of feathers, thistle-down, the hair of horses and other animals, whilst the outer covering is formed of the different lichens that grow on the tree in which it is placed; the whole firmly united and well cemented. This outer finish is no doubt intended to deceive an enemy's eye; in fact, it is very difficult, even with great attention, to distinguish the nest from the bark of the branch on which it is fixed.

Wild chaffinches, on their return in spring, do not delay to sing; those in the house soon learn, but they are obliged to exercise themselves for nearly two months before they can execute their song to perfection. The singing season does not generally extend beyond June, but young chaffinches, brought up in a room, prolong it to October, and sometimes later.

THE SISKIN.*

The Siskin is larger than the goldfinch, and in appearance not so firm and compact. Its prominent colours are black, bright yellow, sulphur-yellow, and a peculiar sort of green, approaching to sage-green, but so peculiar as to give rise to the name of "siskin-green." The bill, though hard and conical, is not, by any means, so powerful as that of the goldfinch, and the bird is altogether of softer manners, and more resembles the canary, except in colour and in being smaller.

THE SISKIN.

The wooded parts of the Continent appear to be its principal haunts; but it is rather confined to the middle latitudes than extended either to the extreme north or south; and when it visits England, its haunts agree with such a locality, as it perches on shrubs and trees, and feeds on the seeds and buds of these, rather than on the seeds of herbaceous plants. In its wild state it is very common in Germany, where it remains all the year, but in winter it wanders about in search of food, and most frequents the parts well planted with alders. In the house, whether in cage or not, it soon becomes very familiar.

When wild, its food varies according to the season; in summer it eats in the woods the seeds of the pine and fir; in autumn, of hops, thistles, burdock; in winter, of the alder and the buds of trees.

In the house its food is poppy-seed and a little hempseed bruised. It is a complete glutton, and, though so small, eats more than the chaffinch; it is at the seed-drawer from morning till night, constantly eating, and driving off all its companions. It does not drink less, and requires abundance of fresh water, yet it bathes but little, only plunging the beak in the water, and thus scattering it over its feathers, but it is very assiduous in arranging them; it may be called a fop always engaged with finery.

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* Fringilla spinus.

The siskin rarely builds its nest among the alders, but generally in the pine forests, placing it at the extremity of the highest branches, and fixing it there with cobwebs, the threads of insects, and lichens. The outer part is well constructed of small twigs, and the lining is formed of finely divided roots. It has two broods in the year, each of five or six eggs, of a light gray, strongly spotted with purplish brown, particularly at the large end. The young males become finer each year till the fourth.

Their plumage and song are both attractive, though with the latter several tones are mingled, that somewhat resemble the noise made by a stocking-loom. This makes them great favourites with stocking-weavers. They imitate tolerably, however, the songs of other birds.

THE CANARY BIRD.*

THIS pleasing bird had its origin in the pleasant climate and delightful valleys of the Canary Islands, and is now spread throughout Europe, part of Asia, and as far as Siberia. The beauty of its form, its plumage, and its song, united with its great docility, soon gained it admittance into the most magnificent abodes, where every one delights in rearing and preserving it, whilst the fairest hands are often eager to present it with the most delicate food.

It was brought into our climate as early as the beginning of the sixteenth century. The arrival of the Canary in Europe is thus described :—A vessel which, besides its merchandise, was bringing a number of these birds to Leghorn, was shipwrecked on the coast of Italy, opposite the island of Elba, where these little birds, having been set at liberty, took refuge. The climate being favourable, they increased, and would certainly have become naturalised, had not the wish to possess them occasioned their being caught in such numbers, that at last they were extirpated from their new country. From this cause Italy was the first European country where the canary was reared. At first their education was difficult, as the proper manner of treating them was unknown; and what tended to render them scarce was, that only the male birds were brought over; there were no females.

The original colour of the canary was gray, inclining to green on the under part of the body, and, on the whole, not unlike that of the linnet. But this has undergone so complete a change from domestication, difference of climate, and hybridising with birds allied in species, that we now have canaries of almost every colour. The prevailing hues, however, are gray, yellow, white, blackish, and reddish-brown; the mixture of which again rises to innumerable varieties. In Italy the canary has bred chiefly with the citril finch and the serin; in Northern Europe, with the linnet, greenfinch, and siskin. "Were it not, indeed," says Bechstein, "a well-established fact, that the canary is a native of the islands of the same name, we might reasonably suppose that it descended from some one or more of the species above mentioned. I have seen a mule, between a siskin and a serin, which exactly resembled a green canary, and also the offspring of a female gray canary, in which no trace of their real parentage was discernible."

Those canaries, which are blackish-gray or grayish-brown, on the upper part of the body, like a linnet, and at the lower part greenish-yellow, like a greenfinch, are the commonest and healthiest birds, and have deviated less from the colour of the original stock. Their eyes are dark brown. Yellow and white canaries have often red eyes, and are not so strong. The reddish-brown canaries, with grayish-brown eyes, are the rarest, and, as to strength and longevity, occupy an intermediate position between the two varieties.

But, as the plumage of the canary generally displays more than one of these colours, the bird is valuable according to the regularity with which it is marked. Those, however, in which the body is yellow or white, and the wings, tail, and head—particularly if crested—yellowish-dun, are now considered the handsomest birds. Next to these are the golden-yellow canaries, with black, blue, or blackish-gray head, wings, and tail; then, the blackish bird, with gray or yellow head and collar; next, the yellow canaries, with black or greenish-yellow head, which, in this case, should have a crest. The gray or almost black canaries, with the yellow breast, and white head and tail, are held in peculiar estimation. Such birds as are irregularly mottled or spotted, as well as those which are uniform in colour, are considered of but little value.

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* Fringilla Canaria: Linnæus.

The female is hardly distinguishable from the male, except that the plumage of the latter is generally brighter in colour. His head, also, is rather larger and longer; the body more slender; the neck not so short; and the legs longer and straighter. Another special characteristic is, that the yellow of the temples, and round the eyes, is always brighter than in any other part of the body.

Those which introduce into their melody some passages of the nightingale's song are the most esteemed of all canaries; they are called Tyrolean canaries, because they are considered natives of the Tyrol, where they breed many of these birds. The second are the English canaries, which imitate the song of the woodlark. But in Thuringia, the preference is generally given to those which, instead of a succession of noisy bursts, know how, with a silvery sonorous voice, to descend regularly through all the tones of the octave, introducing from time to time the sound of a trumpet. There are some males which, especially in the pairing season, sing with so much strength and ardour, that they burst the delicate vessels of the lungs, and die suddenly.

Bechstein thus points out the best rules for obtaining and preserving good singers:—"The most essential is to choose from among the young that which promises a fine tone, and to seclude it from all other birds, that it may learn and remember nothing bad. The same precaution is necessary during the first and second moulting; for, being likely to re-learn (if I may say so) its song, it would introduce into it, with equal ease, foreign parts. It must be observed whether the bird likes to sing alone, or in company with others; for there are some which appear to have such whims, liking to hear only themselves, and which pout for whole years if they are not humoured on this point. Others sing faintly and display their powers only when they can try their strength against a rival. It is very important to distribute regularly to singing birds the simple allowance of fresh food which is intended for the day. By this means they will sing every day equally, because they will eat uniformly, and not pick the best one day, and be obliged to put up with the refuse the next.

"About two spoonfuls of dry food is sufficient for the daily nourishment of a canary; what he leaves may be thrown to the birds which are free in the room, and will serve as a variety to those which have only the universal paste to satisfy their appetite."

About twenty years ago, the writer went to what was then the Cosmorama, in Regent Street, for the purpose of seeing and hearing the first talking canary of which any mention is made. It was an exceedingly fine bird, of beautiful plumage, and the history of its singular power was given by the exhibitor. The canary had been, as usual, in the family room, when it was suddenly heard to speak, and to repeat what it had uttered, and it was not long before its vocabulary was considerably increased; the words being distinctly articulated in the midst of its song. There appeared to have been no teaching of the bird; its power of imitation was spontaneously exercised. At the time the writer heard it, it distinctly uttered the words, *Mary, dicky dear, O pretty dicky dear, and pretty queen.* Five hundred guineas were said to have been offered for the canary, but in a few weeks it was dead.

Mr. Leigh Sotheby has recently described another talking canary. Its parents had previously and successfully reared many young ones; but, about five years ago, they hatched only *one* out of four eggs, the which they immediately neglected, by commencing the rebuilding of a nest upon the top of it. Upon this discovery, the unfledged and forsaken bird, all but dead, was taken away, and placed in flannel by the fire, when, after much attention, it was restored, and then brought up by hand. Thus treated, and away from all other birds, it became familiarised only with those who fed it; and, consequently, its first singing notes were of a character totally different to those usual with the canary.

Constantly being talked to, the bird, when about three months old, astonished its mistress by repeating the endearing terms used in talking to it, such as "*Kissie, kissie,*" with its significant sounds. This went on, and from time to time the little bird repeated other words; and now, it is said, for hours together, except during the moulting season, it astonishes by *ringing the changes*, according to its own fancy, and as plain as any human voice can articulate them, on the several words—"*Dear, sweet Titchie*" (its name), "*Kiss Minnie,*" "*Kiss me, then, dear Minnie,*" "*Sweet, pretty little Titchie,*" "*Kissie, kissie, kissie,*" "*Dear Titchie,*" "*Titchie wee, gee, gee, gee,*" "*Titchie, Titchie.*"

The usual singing notes of the bird are more of the character of the nightingale, mingled occasionally with the sound of the dog-whistle used about the house. It whistles, also, very clearly, the first bar of "*God save the Queen.*" It is hardly necessary to add that the bird is by nature remarkably tame.

THE GREENFINCH.*

THIS bird, called also the Green Linnet and the Green Grosbeak, has a thicker and more convex bill than that of the sparrow, and much less conical than that of the finches. But in the texture of its plumage, the place and structure of the nest, its mode of perching, its air, as well as in other respects, it much more nearly resembles the finches than the sparrows.

The upper part of this bird is olive-green, rather warm and bright in the tint, passing into a yellowish hue, and relieved by gray on the margins of some of the feathers; the top of the head of a rather browner green than the back; the breast is grayish-yellow; the lower parts and under-tail coverts the same. The female has the green and yellow less bright, and is altogether of a browner tint than the male.

Wordsworth has thus skilfully pictured this one of the feathered tribes:—

"Beneath these fruit-tree boughs, that shed
Their snow-white blossoms on my head,
With brightest sunshine round me spread
Of Spring's unclouded weather;
In this sequestered nook how sweet
To sit upon my orchard seat!
And birds and flowers once more to greet,
My last year's friends together.

"One have I marked, the happiest guest
In all this covert of the bless'd;
Hail to thee, far above the rest
In joy of love and pinion,
Thou, Linnet, in thy green array,
Presiding spirit here to-day,
Dost lead the revels of the May,
And this is thy dominion.

"While birds and butterflies and flowers
Make all one band of paramours,
Thou, ranging up and down the bowers,
Art sole in thy employment;
A life, a presence like the air,
Scattering thy blessings without care,
Too bless'd with any one to pair,
Thyself thy own enjoyment.

"Upon yon tuft of hazel trees,
That twinkle to the gusty breeze,
Behold him perched in ecstasies,
Yet seeming still to hover;
There! where the flutter of his wings
Upon his back and body flings
Shadows and sunny glimmerings,
That cover him all over.

"My sight he dazzles, half deceives,
A bird so like the dancing leaves,
Then flits, and from the cottage eaves
Pours forth his song in gushes;
As if by that exulting strain,
He mocked and treated with disdain
The voiceless form he chose to feign
While fluttering in the bushes."

A lady thus wrote to our late eminent ornithologist, Mr. Yarrell:—"You ask for an account of my bird. It was a greenfinch: our acquaintance commenced whilst walking close to —— House. A young bird flew on my shoulder; I drove it away, and it returned a second and a third time. It having shown such a determined wish for my protection, induced me to take it into the house and feed it, intending to let it fly as soon as it was able to provide for itself; but it became in a few days very familiar, perching on our hands, heads, &c., and restless unless sitting on my finger, where it would remain for hours, pecking and playing with my cuff, if permitted.

"It had perfect liberty to go out of doors, and occasionally flew out of the window and returned; sometimes sitting on my finger when I walked in the garden. On one occasion it remained out all night, returning at break of day to my room, the window of which was open to receive it; and, after waiting to be noticed on my awaking, took another flight of some hours. It was his delight, whilst I was dressing, to play with my hair, and he has often fallen into the hand-basin whilst I was washing. I regularly went into my sister's room after breakfast with the bird, and it would often fly before me to her room, as if conscious where it was to go. It was impatient in a cage, and troublesome out, as it was impossible to work or read in quiet. A needle or ring was a very favourite plaything; as soon as it obtained either of them, it would fly round and round the room in triumph. It attached itself, I think, more particularly to me, although my sister was equally fond of it. It was perfectly tractable, and would go anywhere, even into its prison-house, if taken on the finger.

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* Loxia chloris.

"It took a dislike to mamma, I believe, because she often caught it and put it in the cage, while it would go in voluntarily for me at any time. On my return from France, it seemed to have forgotten its old mistress; and on my opening the cage, instead of flying instantly on my finger, it sat still for a long time, and when urged out, flew immediately out of the window to a tree, and all our calling, contrary to former custom, was disregarded. It was Sunday, and the tree stood close to the church. I fear some boys hunted it, and as the cat came from under the same tree in the evening, I fear she surprised our interesting favourite. I have but one thing more to add: it was most destructive to plants in the room, not pulling off the leaves, but applying its bill to the stems, and dividing a heliotrope or geranium stem in an instant. I had it about five months, and took no pains to tame it. I am not fond of birds—compassion was the origin of our acquaintance, and attachment and confidence on the part of the bird won my favour."

THE GREENFINCH.

THE BULLFINCH.*

The Bullfinch is found in most parts of Europe, frequenting woods and gardens; it builds its nest either in the fork of a tree, not very high, or in a bush, generally the white-thorn. About the end of April, or in May, these birds begin the affair of nidification. The nest is composed of small branches interlaced on the outside, and the fibres of roots within. The female lays from four to six bluish-white eggs, with red or brownish spots, particularly towards the greater end. Besides the buds of trees, on which these birds feed, they take also in summer grain and berries, and, it has been said, sometimes insects. Some of them migrate, but others remain during the winter, and then approach nearer to human habitations. They live five or six years.

This species, which possesses many pleasing qualities when caged, is very destructive in a state of nature, by feeding on the buds of fruit-trees, especially pears, apples, and plums. They appear to associate in families of the parents and their young of the same season, an association not determined by the approach of winter, but which continues until the ensuing spring, when the young pair and breed. A woody country, in the vicinity of hills, is their favourite resort. They are usually seen on the upper branches of trees; but should a hawk or anything else alarm them, they descend rapidly into the middle of the thickest bush at hand, and remain there without uttering the slightest noise. In spring, on the contrary, when the family disperses, and the young males select their mates, they are no longer to be found on the tops of trees, but concealed in the thickest bushes, where they would escape all observation, but for the continued call they make use of to one another. The lateness in the season, compared with other birds, of the breeding time of the bullfinch is remarkable; but even this circumstance, trifling and unimportant as it may seem, of their economy is not without a substantial cause. The young are fed, in all probability, on grain, to the exclusion of insects and chrysalises, the usual food of other young birds of this order; and if they were hatched early in the season, it is obvious that grain would neither be so plentiful nor so fit as at a later period.

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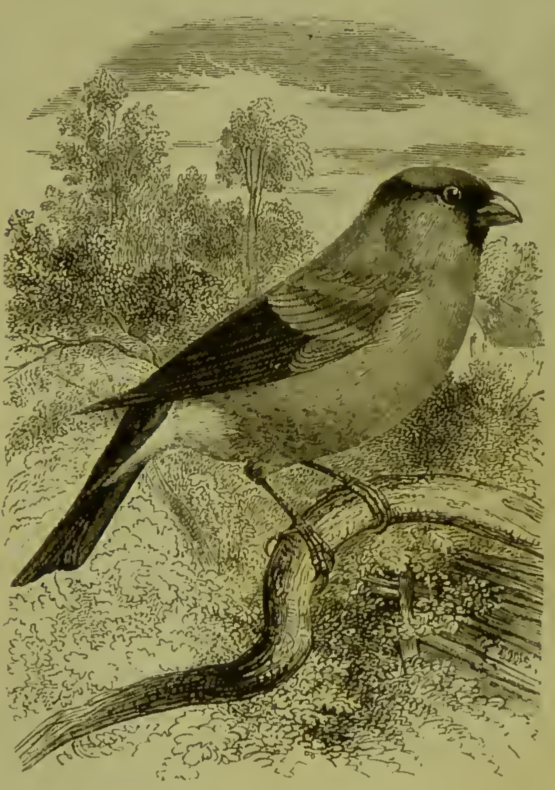
* Loxia pyrrhula.

The bullfinch is a very docile bird, and though the natural song of both sexes is harsh and disagreeable—resembling the creaking of a door or wheelbarrow—they may be trained, as in England, Germany, and Holland, to whistle many airs and songs in a soft, pure, flute-like tone, which is highly prized by amateurs. The bird is generally capable of retaining in its memory three different tunes. Bullfinches are best instructed by a flute, or the whistling of a teacher. They sing at command, make many very elegant gestures, moving now the body and now the tail to the right and left, and spreading out the latter like a fan. To obtain the perfection of whistling, a bird should only be taught one air, together with the usual short flourish or prelude.


THE BULLFINCH.

A great number of piping bullfinches are annually sent to this country, after going through the usual course of instruction. No school can be more diligently attended by its master, and no scholars more effectually trained to their own calling. than a seminary of bullfinches. As a general rule, they are formed into classes of about six in each, and kept in a dark room, when food and music are administered at the same time; so that when the meal is ended, if the birds feel disposed to tune up, they are naturally inclined to copy the sounds which are so familiar to them. As soon as they begin to imitate a few notes, the light is admitted into the room, which still further exhilarates their spirits and inclines them to sing. In some establishments the starving system is adopted, and the birds are not allowed food or light until they sing.

When they have been under this course of instruction for some time, they are committed singly to the care of boys, whose sole business is to go on with their education. Each boy assiduously plays his organ from morning till night, for the instruction of the bird committed to his care, while the class-teacher goes his regular rounds, superintending the progress of his feathered pupils, and scolding or rewarding them in a manner which they perfectly understand, and strictly in accordance with the attention or disregard they have shown to the instructions of the monitor.

This round of teaching goes on unintermittingly for no less a period than nine months, by which time the bird has acquired firmness, and is less likely to forget or spoil the air by leaving out passages, or giving them in the wrong place. At the time of moulting, the best instructed birds are liable to lose the recollection of their tunes, and therefore require to have them frequently repeated at that time, otherwise all the previous labour will be thrown away. There are celebrated schools for these birds at Hesse and Fulda, from whence all England, Germany, and Holland receive supplies of the little musicians.

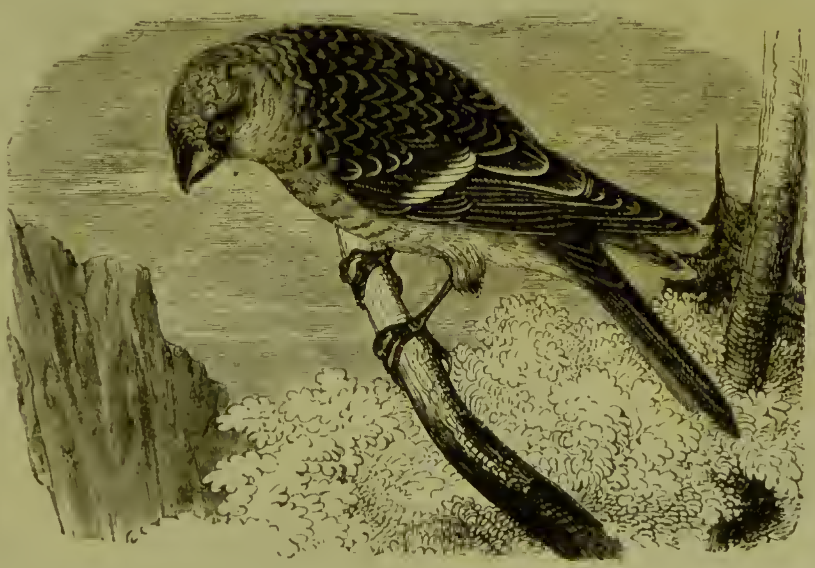
The bullfinch may also be brought to articulate words, and the female is equally capable of their acquirement with the male. They show also more attachment than other small birds in general, and can distinguish strangers from those who have the care of them, or are their teachers.

Mr. Kidd, who has written so much that is deeply interesting about birds, after an acquaintance with them and an attachment to them which are extremely rare, pleasantly says:—"Now let me say a kind word for the bullfinch. Talking of attachments, what can equal the attachment of one of these sweet little creatures to his master or mistress? One that lived with me a number of years always had its liberty during spring and summer. It would follow me all about the house; and in the morning, perched on my pillow, it would guard me with the fondest affection—flying at, fighting, and scolding any one who ventured into my apartment.

"My little champion was a bachelor. Wishing to please him, I procured him a mate; but thinking me, perhaps, over-officious, he declined making himself agreeable, and the match never came off. I confess his principles were very orthodox, and very proper. It is *not* right, as a general rule, to interfere in matters of this kind; and when we lay any such 'plans,' we can hardly wonder if they fail of their intended aim. This by the way. Certain it is that he preferred a life of celibacy, and was happiest by himself. Yet was the partner I had assigned to him a charming little creature, and very tame. Her temper, too, was excellent, and her disposition most amiable. In no way offended at the slight put upon her, she listened to the bachelor's song, and learned it perfectly. The only difference was, that she sung his note in a softer tone. I *ought* to have given him 'a choice.'"

THE PINE GROSBEAK.*

This bird, sometimes called the Pine Bullfinch, is more abundant in the northern parts of Europe and America than elsewhere.



THE PINE GROSBEAK.

According to Audubon, its flight is undulating and smooth, performed in a direct line when it is migrating, at a considerable height above the forests, and in groups of from five to ten individuals. They alight frequently during the day, on such trees as are opening their buds or blossoms. At such times they are extremely gentle, and easily approached. They are exceedingly fond of bathing, and whether on the ground or on branches, move by short leaps. "I have been surprised," says Audubon, "to see, on my having fired, those that were untouched fly directly towards me until within a few feet, and then slide off, and alight on the lower branches of the nearest tree, where, standing as erect as little hawks, they gazed upon me as if I were an object quite new, and of whose nature they were ignorant. They are easily caught under snow-shoes put up with a figure of four, around the wood-cutters' camps, in the state of Maine, and are said to afford good eating. Their food consists of the buds and seeds of almost all sorts of trees; occasionally also, they seize a passing insect. I once knew one of these sweet songsters, which, in the evening, as soon as the lamp was lighted in the room where its cage was hung, would instantly tune its voice anew."

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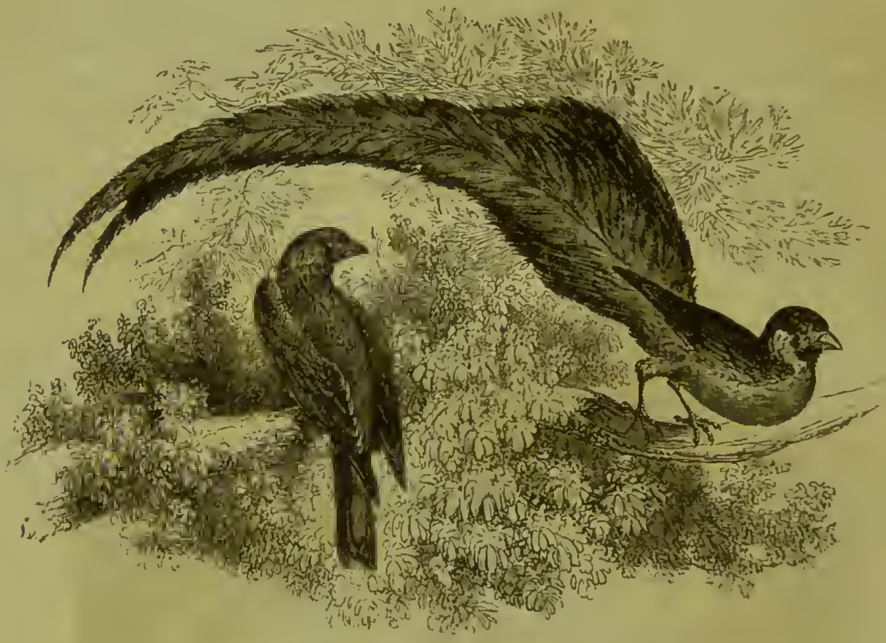
* Pyrrhula enucleator

The nest of this species is built of small sticks, lined with feathers, and usually placed on a branch of a tree, a few feet only above the ground. It lays four or five eggs, of a pale green, with a few spots and streaks of purplish brown.

Another genus, a sub-family of Fringillidæ,* the Weavers—*Tisserines* of the French—is thus described by Mr. Swainson :—Size small ; bill conic ; but with the culmen slightly bent and the tip entire ; under mandible less thick than the upper ; claws large, very long ; wings pointed, but the first quill remarkably short and spurious. It inhabits the Old World only.

THE BROAD-SHAFTED WHIDAH FINCH.†

The bill of the Weavers is robust, advancing on the forehead in the form of an acute angle ; it is convex above, a little compressed on the sides, entire, nearly straight, sharp, and sometimes a little gibbous. The lower mandible has its edges bent inwards ; the tongue is cartilaginous and fringed at the point ; the nostrils are oblong and covered with a membrane.



THE BROAD-SHAFTED WHIDAH FINCH.

Most of these birds are found in India or Africa. Their generic name is derived from the wonderful art with which they construct their nests, interlacing them with blades of grass ; in which talent they resemble some other birds, the inhabitants of far-distant lands.

Of one of these we have given an engraving, the Dicæan Swallow, which is found in nearly every part of Australia in which colonies have been established. This bird selects the place of its nest in close proximity to a river or stream, in shrubs or bushes, as *loranthus* or *acacia*, and forms it like a purse, of the leaves of different sorts of plants.

Another bird of that country is the *Malurus cyaneus*, which chiefly inhabits sterile places, on the borders of rivers and torrents. The nest, constructed of similar materials, is in the form of a sphere, with an opening at the side, and is interlaced with feathers and hairs. There are usually four eggs of a delicate whiteness. These birds have, like many others, a summer and a winter attire, and become in the rigorous season very familiar.

Of Cuvier's genus *vidua*, the Whidah-bird is one of the most elegant species. In organisation and in manners they are true linnets. In captivity, which they endure without much appearance of constraint, they are lively and active, jumping from perch to perch, and alternately raising and depressing their long tails with much vivacity. They are usually fed upon grain, with the occasional addition of green herbs ; and are fond of bathing in the water which is placed in their cage. Twice a year they are

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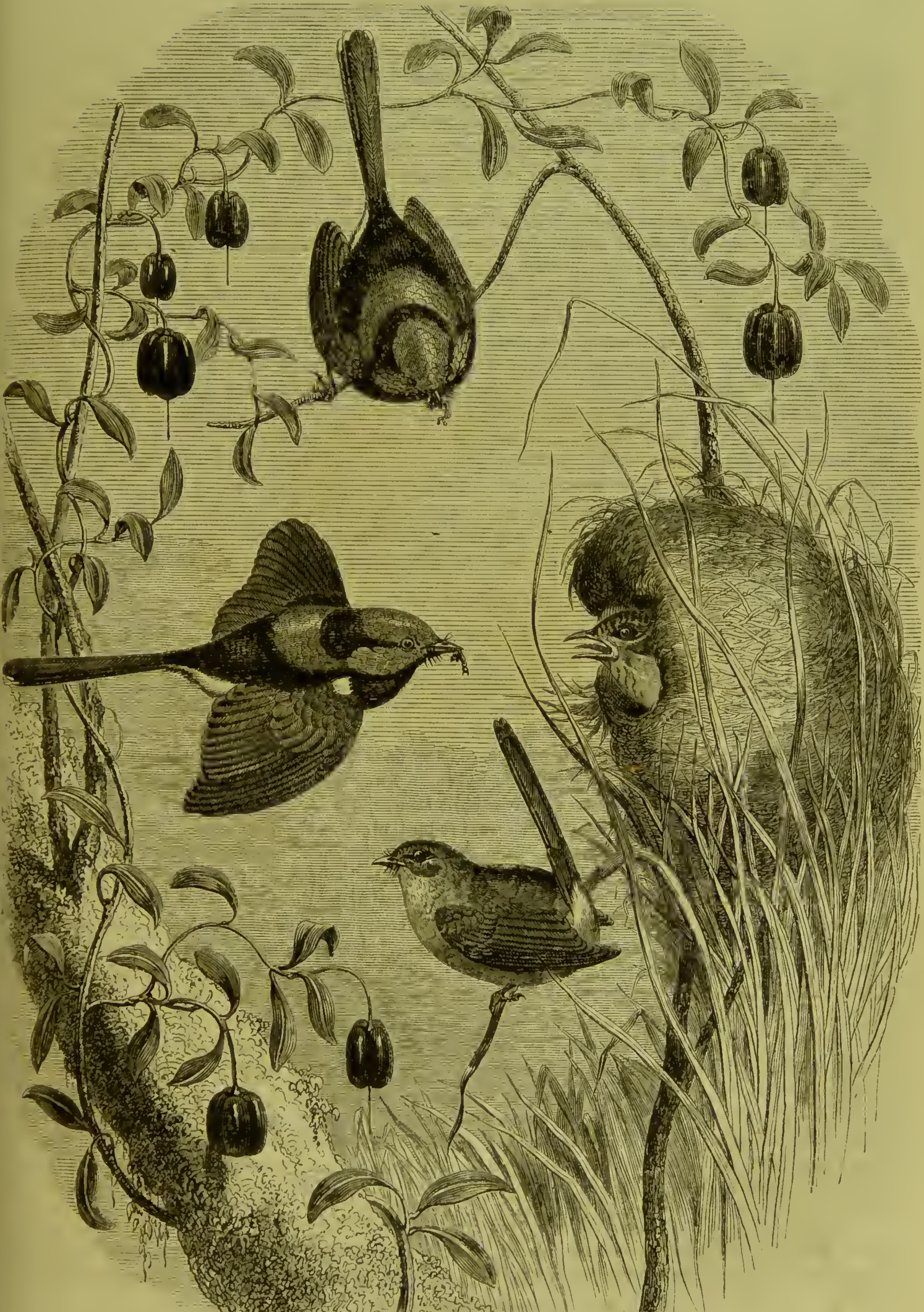
* Ploceinæ.

† Vidua paradisea.

DICÆAN SWALLOWS.



THE MALURUS CYANEUS.

subject to changes of plumage, which alter the appearance—of the male especially—to such an extent, that it would be difficult to recognise in him the same bird. The long feathers, which are his peculiar attribute, fall off towards the end of autumn, and, with the other changes that take place in his plumage, leave him little to distinguish him, during the winter months, from his plainer mate. But in spring he recovers his long feathers, his more brilliant hues, and his sharp, but agreeable and varied note; the change being usually completed by the beginning of June. It is said that they live for twelve or fifteen years.

Of all the genera composing the family of weavers, the Broad-shafted Whidah Finch is the most striking. It is composed of very small birds, mostly not larger than canaries. The males, during the breeding season, are decorated with exceedingly long tail-feathers, often four times the length of the bird itself, and which, however ornamental, must rather impede the action of flight. Little or nothing is known of the habits and manners of the whidah finches in a state of nature, but they have always been among the most favourite cage-birds; and although not very frequent in the aviaries and houses of this country, they are common in those of France and other parts of the Continent.

Numbers of these, and the other pretty finches of the same country, are imported into France by the Senegal traders, and sold to the *marchands des oiseaux* of Paris. A resident in that city states that he was not a little surprised to find between a hundred and fifty and two hundred of these inhabitants of the torrid zone flying and sporting about in a small, dark, dirty room, transformed into a sort of aviary in one of the meanest houses on the Quai Voltaire, two rooms only of which were tenanted by a *marchand des oiseaux*—his birds living in one, and himself and his family living in the other. He adds:—"We have been assured that these ingenious people, who are really practical ornithologists, contrive to breed several of these African natives in these dingy quarters."

THE PHILIPPINE GROSBEAK.*

THE Philippine Grosbeak is one of the best known of the genus; its general colour is dull-yellow, blotched with brown; the throat is black. It is said to be very common in Dukhun; and there are four wells, overhung by a tree, where their nests are now seen pendent. The nest is woven in the shape of an inverted flask—the entrance being at the extremity of a prolonged neck, through which is a passage to a snug little chamber in the round body of the nest itself. These birds live in small communities, and are very noisy in their labours. They associate so readily with the common sparrow that, at the season of the grass seeds, Colonel Sykes, in firing into a flock of sparrows on the grass-plots in his own ground, killed as many weaver-birds as sparrows.

The peculiar position of the nest of the weaver-bird protects them, to a great extent, from their enemies, the monkeys, but more especially from the deadly attacks of the snake tribes, which abound in these regions. Dr. Smith, in his "Zoology of South Africa," expresses his decided opinion, that the fear of injury from small quadrupeds and snakes operates upon the birds of that country in their selection of the trees on which they shall build. The influence which snakes produce upon these birds, when they come in contact with them, is very singular. The boom-slange, which, however, is not considered poisonous, is one of its most common foes; and it is generally found upon trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree is generally soon discovered by the birds of the neighbourhood, who collect around it, and fly to and fro, uttering the most fearful sounds, until some one, more terror-stricken than the rest, actually skims along so as to touch its lips, and, as a fly will destroy itself in the flame of a candle, becomes, almost without resistance, a prey to its enemy. During these proceedings, the snake may usually be observed with its head raised about ten or twelve inches above the branch round which its body and tail are entwined, with its mouth open, and its neck inflated, as if anxiously endeavouring to increase the terror which it would almost appear it was aware would, sooner or later, bring within its grasp one of the feathered group.

THE BOTTLE-NESTED SPARROW.

FORBES describes another interesting species, under the name of Baya, or Bottle-nested Sparrow, "which," he says, "is remarkable for its pendent nest, brilliant plumage, and uncommon sagacity.

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* Ploceus Philippensis: Cuvier.

These birds are found in most parts of Hindostan; in shape they resemble the sparrow, as also in the brown feathers of the back and wings; the head and breast are of a bright yellow, and, in the rays of a tropical sun, have a splendid appearance when flying by thousands in the same grove. They make a chirping noise, but have no song; they associate in large communities, and cover extensive clumps of palmyras, acacias, and date trees with their nests. The nest is formed in a very ingenious manner, by long grass woven together in the shape of a bottle, and suspended by the other end to the extremity of a flexible branch, the more effectually to secure the eggs and young brood from serpents, monkeys, squirrels, and birds of prey. These nests contain several apartments appropriated to different purposes; in one the hen performs the office of incubation; another, consisting of a little thatched roof, and covering a perch, without a bottom, is occupied by the male, who, with his chirping note, cheers the female during her maternal duties.

THE SOCIABLE GROSBEAK.*

THE Sociable Grosbeak, of Southern Africa, excels any of its feathered race in the extent, if not in the beauty, of its habitation. Usually selecting a large and lofty tree, often of the mimosa or sensitive plant species, these birds find under its ample top and strong wide-spreading branches a good shelter and support for their erection. Having chosen the site, the framework is constructed by the combined efforts of the fraternity at large, who will derive from it a common advantage. The nest is firmly interwoven with the branches of the tree on which it rests, and often a large part of a principal branch is included within its substance. This part of the work being completed, each pair proceeds to the construction of its own nest, which, like the roof, consists of grass.

The best description we have of these birds is that by Le Vaillant, in his "Travels in Africa." His narrative is as follows:—"I observed, on the way, a tree with an enormous nest of these birds, to which I have given the appellation of *republicans;* and, as soon as I arrived at my camp, I dispatched a few men with a wagon to bring it to me, that I might open the hive and examine its structure in its minutest parts. When it arrived, I cut it to pieces with a hatchet, and saw that the chief portion of the structure consisted of a mass of Bushman's grass, without any mixture, but so compact and firmly basketed together as to be impenetrable to the rain. This is the commencement of the structure; and each bird builds its particular nest under this canopy, the upper surface remaining void; without, however, being useless; for as it has a projecting rim and is a little inclined, it serves to let the rain water run off, and preserve each little dwelling from the rain. Figure to yourself a huge, irregular, sloping roof, all the eaves of which are completely covered with nests crowded one against another, and you will have a tolerably accurate idea of these singular edifices. Each individual nest is three or four inches in diameter, which is sufficient for the bird. But as they are all in contact with one another around the eaves, they appear to the eye to form but one building, and are distinguishable from each other only by a little external aperture which serves as an entrance to the nest; and even this is sometimes common to three different nests, one of which is situated at the bottom and the other two at the sides." According to Patterson, the number of cells increasing in proportion to the increase of inhabitants, the old ones become streets of communication formed by line and level. No doubt, as the republic increases, the cells must be multiplied also; but it is easy to imagine that, as the augmentation can take place only at the surface, the new buildings will necessarily cover the old ones, which must therefore be abandoned. Should these even, contrary to all probability, be able to subsist, it may be presumed that the depths of their situation, by preventing any circulation and renewal of the air, would render them so extremely hot as to be uninhabitable. But while they would thus become useless, they would remain what they were before—real nests—and change neither into streets nor sleeping rooms.

"The largest nest that I examined," says Patterson, "was one of the most considerable I had anywhere seen in the course of my journey, and contained 320 inhabited cells, which, supposing a male and a female to each, would form a society of 640 individuals. Such a calculation, however, would not be exact." It appears that in every flock the females are more numerous by far than the males; many cells, therefore, would contain only a single bird. Still, the aggregate would be considerable; and, when undisturbed, they might go on to increase, the structure increasing in a like ratio, till a storm, sweeping through the wood, laid the tree and the overwhelming edifice it sustained in one common ruin.

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* Ploceus socius. Loxia Socia of Latham.

The industry of these birds seems almost to equal that of the bee. Throughout the day they appear busily employed in carrying a fine species of grass, which is the principal material they employ for the purpose of erecting their extraordinary work, as well as for additions and repairs.

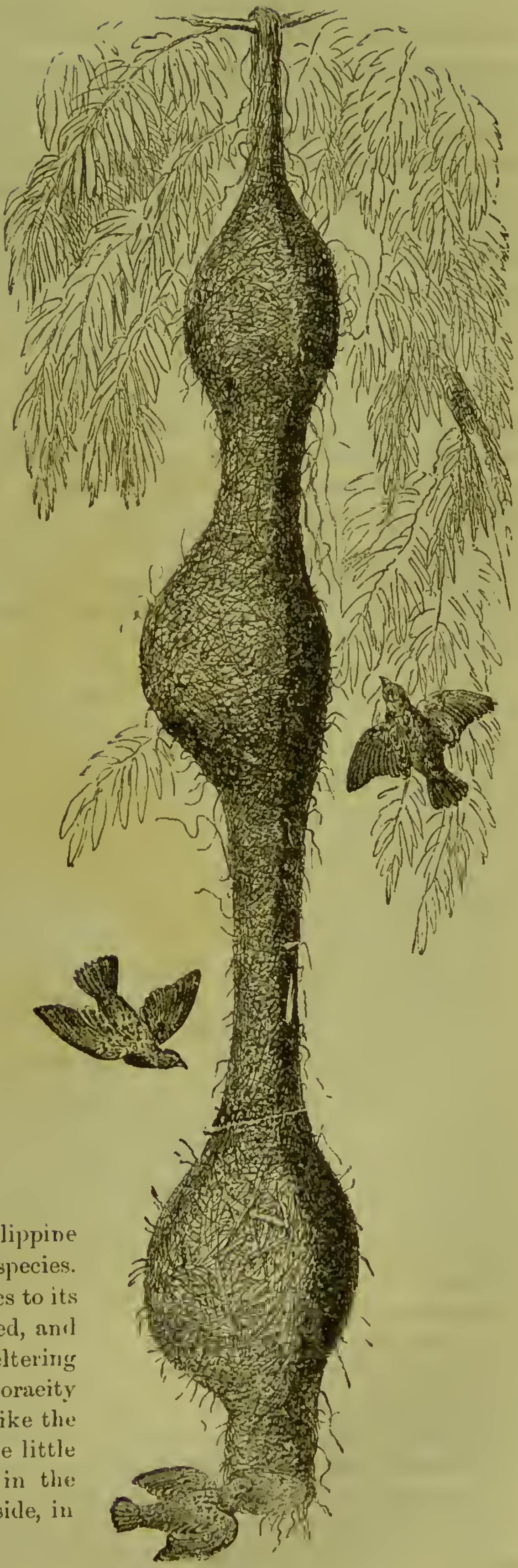
"Though," adds Patterson, "my short stay in the country was not sufficient to satisfy me by ocular proof that they added to their nests as they annually increased in their numbers, still, from the many trees which I have seen borne down by the weight, and others that I have seen with their boughs completely covered over, it would appear that this is really the case. When the tree that is the support of this aërial city is obliged to give way to the increase of weight, it is obvious that they are no longer protected, and are under the necessity of building in other trees. One of these deserted nests I had the curiosity to break down, to inform myself of the internal structure of it, and found it equally ingenious with that of the external. There are many entrances, each of which forms a regular street, with nests on both sides, at about two inches' distance from each other. The grass with which they build is called the Boshman's grass, and I believe the seed of it to be their principal food; though, on examining the nests, I found the legs and wings of different insects. From every appearance, the nest which I dissected had been inhabited for many years, and some parts were much more complete than others. This, therefore, I conceive to amount nearly to a proof that the birds added to it at different times, as they found it necessary, from the increase of their family, or, rather, of the nation and community."

THE SOCIABLE GROSBEAK.

THE LOXIA BENGALENSIS.*

This species inhabits India. The bird constructs its nest of vegetable fibres, which it interlaces in such a manner as to form a sort of purse, of which the engraving gives an exact representation. It suspends its nest on the higher branches of trees overhanging rivers; and the entrance is observable at the lower end. The first year the nest is a simple purse; but in the following one, the bird attaches to this a second, and proceeds annually with a similar addition to the curious fabric.

THE BENGAL LOXIA.



NEST OF THE LOXIA BENGALENSIS

THE ABYSSINIAN GROSBEAK.

This bird has been represented as a variety of the Philippine Grosbeak, but it more probably constitutes a distinct species. It is a native, as its name denotes, of Abyssinia, and gives to its nest a different form from that of the bird just mentioned, and displays rather more industry in its precautions for sheltering its offspring from the humidity of the weather and the voracity of its enemies. It rolls its nest in a spiral form, not unlike the shell of the nautilus, suspends it to the extremity of some little branch over a placid stream, and fixes the entrance in the lower part; but the aperture is always on the eastern side, in opposition to the direction of the rain.

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* Coccothraustes chrysocephala: Vieillot.

THE CAP-MORE.*

THIS weaver-bird is a native of Senegal, and also of the kingdoms of Congo and Cacoucongo. Like most of the birds inhabiting these burning regions of Africa, its livery varies according to the season. In spring, for instance, its head is covered with a sort of capouche, of a reddish-brown, which, in the after season, changes to a yellow; its song is peculiar and very lively. Some of these birds, when seen in France, evinced a disposition to nestle, though unexcited by the presence of the female; they constructed nests with blades of grass or reeds, interlaced in the wires of their cage. It is probable that, with care, and the production of a proper degree of warmth, they might be made to multiply even in these climates.

THE PENSILE GROSBEAK.†

THE nest of this bird is said to be inferior to some of the fabrics already described, yet it is unquestionably a very curious structure. The bird composes it of straw and reeds, interlaced with much dexterity, and suspends it to a flexible branch, on the edge of a rivulet; it forms a pouch in the upper part, in which the eggs are deposited, and fits to this an elongated tunnel, leading downwards, at the end of which the entrance is situated. When the second brood takes place, the bird attaches a new nest to the former, and so on successively; five or six hundred of these nests may be sometimes seen thus suspended to a single tree. The female lays only three eggs.

If, however, Africa and India have these birds so remarkable as weavers, there are some in America well entitled to notice.

THE BALTIMORE ORIOLE.‡

"THIS bird," says Audubon, "arrives from the south, perhaps from a more distant region, and enters Louisiana as soon as spring commences there. It approaches the planter's house, and searches among the surrounding trees for a suitable place in which to settle for the season. It prefers, I believe, the trees that grow on the sides of a gentle declivity. The choice of a twig being made, the male oriole becomes extremely conspicuous. He flies to the ground, searches for the longest and driest filaments of moss, which in that state is known by the name of Spanish beard, and whenever he finds one fit for his purpose, ascends to the favourite spot where the nest is to be, uttering all the while a continued chirrup, which seems to imply that he knows no fear, but, on the contrary, fancies himself the acknowledged king of the woods. No sooner does he reach the branches, than with bill and claws, aided by an astonishing sagacity, he fastens one end of the moss to a twig with as much art as a tailor might do, and takes up the other end, which he secures also, but to another twig a few inches off, leaving the thread floating in the air, like a swing, the curve of which is, perhaps, seven or eight inches from the twigs. The female comes to his assistance with another filament of moss, or perhaps some cotton thread, or other fibrous substance, inspects the work which her mate has done, and immediately commences her operations, placing each thread in a contrary direction to those arranged by her lordly mate, and making the whole cross and re-cross, so as to form an irregular network. The nest has now been woven from the bottom to the top, and so secured that no tempest can carry it off without breaking the branch to which it is suspended. Remark what follows. This nest contains no warming substance, such as wool, cotton, or cloth, but is almost entirely composed of the Spanish moss, interwoven in such a manner that the air can easily pass through it. The parents are, no doubt, aware of the intense heat which will exist ere long in this part of the world, and moreover take especial care to place their nest on the north-east side of the trees. On the contrary, had they gone as far as Pennsylvania or New York, they would have formed it of the warmest and softest materials, and have placed it in a position which would have left it exposed to the sun's rays; the changes of the weather during the early period of incubation being so great there, that the bird looks on these precautions as necessary to insure the life of its brood against intense cold, should it come; while it knows that the heat in these northern latitudes will not be so great as to incommode them."

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* Ploceus textor.

† Ploceus pensilis.

‡ Wilson.

In confirmation of this statement, Wilson, speaking of this bird, which he says arrives in Pennsylvania in May, observes of a nest before him: "The materials are flax, hemp, tan, hair, and wool, woven into a complete cloth; the whole tightly sewed through and through with long horse-hairs, several of which measure two feet in length. The bottom is composed of thick tufts of cow-hair, sewed also with strong horse-hair. So solicitous is the baltimore to procure proper materials for his nest, that in the season of building, the women in the country are under the necessity of watching their thread that may chance to be out bleaching, and the farmer to secure his young grafts; as the baltimore finding the former, and the strings which tie the latter, so well adapted for his purpose, frequently carries off both; or should the one be too heavy, and the other too firmly tied, he will tug at them a considerable time before he gives up the attempt. Skeins of silk and hanks of thread have often been found, after the leaves were fallen, hanging round the baltimore's nest, but so woven up and entangled as to be entirely irreclaimable."

THE ORCHARD ORIOLE.*

The Orchard Oriole is another of this genus, which visits the United States in spring, and fixes his pendent nest to the extremity of the twigs of spreading trees. Wilson says, "These birds are so particularly fond of frequenting orchards, that scarcely one orchard in summer is without them. They usually suspend their nest from the twigs of the apple-tree, and often from the extremities of the outward branches. It is formed exteriorly of a particular species of long, tough, and flexible grass, knit or sewed through and through in a thousand directions, as if actually done with a needle. An old lady of my acquaintance, to whom I was one day showing this curious fabrication, asked me, in a tone between joke and earnest, whether I did not think it possible to teach these birds to darn stockings? The nest is hemispherical, three inches deep by four in breadth; the concavity scarcely two inches deep by two in diameter. I had the curiosity to detach one of the fibres or stalks of dried grass from the nest, and found it to measure thirteen inches in length, and in that distance it was thirty-four times hooked through and returned, winding round and round the nest! The inside is usually composed of the light downy appendages attached to the seeds of the *platanus accidentalis*, or button wood, which form a very soft and commodious bed. Here and there the outward work is extended to an adjoining twig, round which it is strongly twisted, to give more stability to the whole, and prevent it from being overset by the wind. When they choose the long pendent branches of the weeping willow to build in, as they frequently do, the nest, though formed of the same materials, is made much deeper, and of lighter texture. The circumference is marked out by a number of these pensile twigs that descend on each other, like ribs, supporting the whole; their thick foliage, at the same time, completely concealing the nest from view. These long pendent branches, being sometimes twelve and even fifteen feet in length, have a large sweep in the wind, and render the first of these precautions necessary to prevent the eggs or young from being thrown out; and the close shelter afforded by the remarkable thickness of the foliage is, no doubt, the cause of the latter." The orchard oriole is a lively, active, restless bird, never idle, never inanimate, but perpetually on the alert, his shrill and rapid carol being maintained with little intermission. He keeps up a system of destruction among the insect tribes and caterpillars which infest the leaves and buds of fruit-trees, thereby rendering man no little service, for hundreds of these pests to the farmer are not sufficient for the daily consumption of himself, his mate, and their young. The multitudes thus destroyed by a single pair of birds must be prodigious.

THE MALIMBIC TANAGER.†

This bird is so called by Latham, because it inhabits Malimba, a country on the eastern coast of Africa, in the kingdom of Congo, where it was first observed by Perrein. These birds usually sojourn on trees bearing figs, which exactly resemble those of Europe, and place their nests on such of the branches as form a triangle. The nest is of a round form, with the aperture worked on the side; the exterior is composed of fine plants, arranged ingeniously, and the interior is furnished with cotton. The eggs are from three to five, of a grayish colour, and the male and female partake of the incubation. It is in the months of October and November that these birds are found in Malimba; they remain on the fig-trees only while they are laden with fruit; and when that disappears, the birds are gone, and do not return until the following year.

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* Icterus mutatus: Wilson.

† Ploceus Cristatus.

THE BLACK-COLLARED FINCH.

This bird exhibits wonderful industry in the making of its nest, and great foresight in protecting its young from rain, and from the attacks of little animals. The form of its abode is pyramidal. It is always suspended above the water, and at the extremity of a little branch. The aperture is on one of the faces of the pyramid, and usually turned towards the east. The cavity of this pyramid is separated into two parts by a partition, thus forming, as it were, two chambers. The first, in which is the entrance to the nest, is a sort of vestibule, where the bird first introduces itself; then he climbs up the intermediate partition, and descends to the bottom of the second chamber, where the eggs are deposited. This species is a native of Senegal and Abyssniia.

Another tribe of birds,* belonging to the same family,† is characterised by Cuvier as having a conical bill, triangular at its base, slightly arched at its arête, and notched towards the end: the wings and flight are short.

The Tanagers live on berries, insects, and small grains; they seek their food in thickets, among brushwood, on plants and trees, many of them hopping about on all the branches, in search of insects. Most of them are remarkable for the richness and brilliancy of their colours; accordingly M. d'Azara gives them a Spanish name expressive of this attribute, *Lindo*, which, both in Italian and Spanish, means spruce, neat, elegant.

As we find it to be frequently the case in the feathered kingdom, this external beauty is not accompanied by any corresponding melody or power of voice: very few indeed of the tanagers possess agreeable notes. Their movements are rapid and abrupt, their flight lively, and their natural disposition active. They rarely descend to the earth, and when they do, instead of walking they proceed by jumps.

Some frequent the interior of large forests, where they are attracted by certain berries of which they are extremely fond. Others usually sojourn on the borders of woods, and others on the dry grounds, where they conceal themselves in bushes and briars; others again prefer the summits of trees, and many visit rural habitations, where they frequent the gardens and the meadows. Such species love the society of their fellows, and unite in flocks more or less numerous; others live in families, some in pairs, and some even solitarily. The tanagers, stationed in the torrid zone, hatch at different seasons; but they lay a smaller number of eggs than the natives of temperate climates.

America is the country of the tanagers; and the greater number of species are found in the equinoctial part of that vast continent. The form of the bill is somewhat conical, but inflated at the sides, the edge of the upper mandible being irregular, as if slightly toothed.

THE SCARLET TANAGER.‡

"Among all other birds," says Wilson, "that inhabit our woods, there is none that strikes the eye of a stranger, or even a native, with so much brilliancy as this. Seen among the green leaves, with the light falling strongly on his plumage, he really appears beautiful. If he has little melody in his notes to charm us, he has nothing in them to disgust. His manners are modest, easy, and inoffensive; he commits no depredations on the property of the husbandman, but rather benefits him by the daily destruction in spring of many noxious insects; and when winter approaches he is no plundering dependent, but seeks in a distant country for that sustenance which the severity of the season denies to his industry in this. He is a striking ornament to our rural scenery, and none of the meanest of our rural songsters. Such being the true traits of his character, we shall always with pleasure welcome this beautiful inoffensive stranger to our orchards, groves, and forests." In length the Scarlet Tanager is six inches and a half; the tail is forked.

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* Tanagrinæ.

† Fringillidæ.

‡ Tanagra tatus.

The nest of the scarlet tanager is built about the middle of May, on the horizontal branch of some shady forest tree, commonly in an oak, but sometimes in an orchard tree, as but slightly put together, and usually framed of broken rigid stalks of dry weeds or slender fir-twigs, loosely interlaced, and partly tied with narrow strips of Indian hemp, some slender grass-leaves, and pea-vine runners, or other frail materials; the interior being sometimes lined with the slender wiry brown stalks of the Canadian cistus, or with slender pine-leaves; the whole so thinly plaited as to admit the light through the interstices. The three or four eggs are dull blue, spotted with two or three shades of brown, or purple, most numerous towards the larger end. As soon as their single brood, which is fledged early in July, is reared, these birds leave for the south, generally about the middle or end of August.

THE CROSSBILL.

The female shows great solicitude for the safety of her only brood; and on an approach to the nest, appears to be in great distress and apprehension. When they are released from her more immediate protection, the male, at first cautious and distant, now attends and feeds them with activity, being altogether indifferent to that concealment which his gaudy dress seems to require from his natural enemies. So attached to his interesting brood is now the scarlet tanager, that he has been known, at all hazards, to follow for half a mile one of the young, submitting to feed it attentively through the bars of a cage, and, with a devotion which despair could not damp, roost by it in the branches of the same tree with its prison.

Another family is formed of the Crossbills.* The bill of these birds is moderate, strong, and very much compressed; the two mandibles equally curved, hooked, and the elongated points crossing each other. The nostrils are basal, lateral, rounded, and concealed by hairs directed forwards. The feet have three toes before and one behind; the anterior toes are divided. The wings are moderate, the first quill longest. The tail is forked.

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* Loxiadæ: Vigors.

THE CROSSBILL.*

"THE beak of the crossbill," says Yarrell, "is altogether unique in its form; the mandibles do not lie upon each other, with their lateral edges in opposition, as in other birds, but curve to the right and left, and always in opposite directions to each other. In some specimens the upper mandible is turned to the right, the lower mandible curved to the left; in others, the position of the mandible is reversed as to their direction. In the specimen I examined the upper mandible curved downwards, and to the left, the under portion turned upwards, and to the right. When holding the head of this bird in my fingers, I found I could bring the point of the under mandible in a line underneath and touching the point of the upper, but not beyond it towards the left side, while on its own side the point passed with ease to the distance of three-eighths of an inch. The upper mandible has a limited degree of motion on the cranium, the superior maxillary and nasal bones being united to the frontal by flexible bony laminæ."

The great pine-forests, such as the Hartz in Germany, are the natural places of residence of the crossbills, and the seed of the cones of these trees their food; and it is to pull out the seeds from between the scales of the cones that this structure has been given them by the great Creator. Their mode of operation is as follows:—they first fix themselves across the cone, then bring the points of the maxillæ from their crossed or lateral position to be immediately over each other. In this reduced compass they insinuate their beaks between the scales, and then opening them, not in the usual manner, but in drawing the inferior maxilla sideways, the scales are forced open. At this stage of the proceeding the aid of the tongue is needed, and this member is as perfectly adapted to render it as the beak is to accomplish its purpose.

Another family is that of the Starlings,† embracing a considerable number of groups, approaching each other in their gregarious and migratory habits. They are found in every part of the globe, united in large flocks, carrying destruction among the cultivated fields, and following herds of cattle for the sake of the insects or grains that may be picked off from their bodies, or in their neighbourhood. The whole of the family are united by their manners, and the straight and conical form of the beak, the ridge of which passes back to some extent over the forehead.

THE COMMON STARLING.‡

THE length of this bird is eight inches and a half, two and a half of which belong to the tail, and one to the beak, which is awl-shaped, angular, flattish, and rather blunt, yellow, brown towards the end, and the tip blue. The iris is nut-brown; the claws an inch long, and deep flesh-coloured. All the plumage is of a blackish hue, changing to purple towards the front of the body, and to green towards the hind part, and on the wing coverts; the quill-feathers and tail are black, edged with light rust-red; the tips of the head-feathers, and under the neck, are reddish-white, those of the back light rust-red, and those of the under part of the body whitish, which gives the bird a speckled appearance. The old males are darker, having no white tips to the feathers of the head, cheeks, throat, or belly. The beak of the female is rather brown than yellow; the light spots on the head, neck, and breast, are larger, and the edge of the feathers is wider, which gives it a lighter and more speckled appearance.

The Starling, like other families, has its varieties; such are the white, the streaked or variegated, the white-headed, that whose body is white with a black head, and the ash-gray.

When wild the starling is found all over the old world. It prefers forests and little thickets, surrounded by fields and meadows; it is often seen, especially in spring, on towers, steeples, and churches; but it is never found either on high mountains or ridges. In Britain it departs in October in great flights for the south, and returns in like manner in the beginning of March. During the journey, these birds pass the night among the rushes, where, on the least alarm, they make a great tumult.

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* Loxia curvirostra.

† Sturnidæ.

‡ Sturnus Vulgaris: Linnæus.

In confinement it would be very amusing to let them run free; but let them be ever so neat themselves, they would render the room dirty. When captured, they must be furnished with a cage at least two feet long, and one and a half both in height and width. Very restless and always in motion, they require sufficient space to take exercise and keep their plumage uninjured.

When wild they eat not only caterpillars, snails, worms, insects, and the flies which torment the cattle in the field, but also cherries, grapes, berries of all sorts, and different sorts of grain, as millet and hemp-seed.

THE COMMON STARLING.

In confinement they eat meat, worms, bread, cheese, the universal paste—indeed, any food, provided it is not sour. When first caught, they are supplied with earth and meal-worms, and they soon become as tame as if they had been brought up from the nest; but as there is no rule without exceptions, we sometimes meet with individuals who obstinately refuse to eat, whatever pains may be taken to induce them, and which die of hunger. This bird delights in bathing often; it must therefore never be left without fresh water in a proper vessel.

The starling builds in the holes of trees, and even in boxes, or pots with long necks, suspended to trees, or under the roof, or in pigeon houses. Its simple nest is composed of dry leaves, hay, and feathers. Like the swallow, it returns to the same nest every year, only taking care to clear it out.

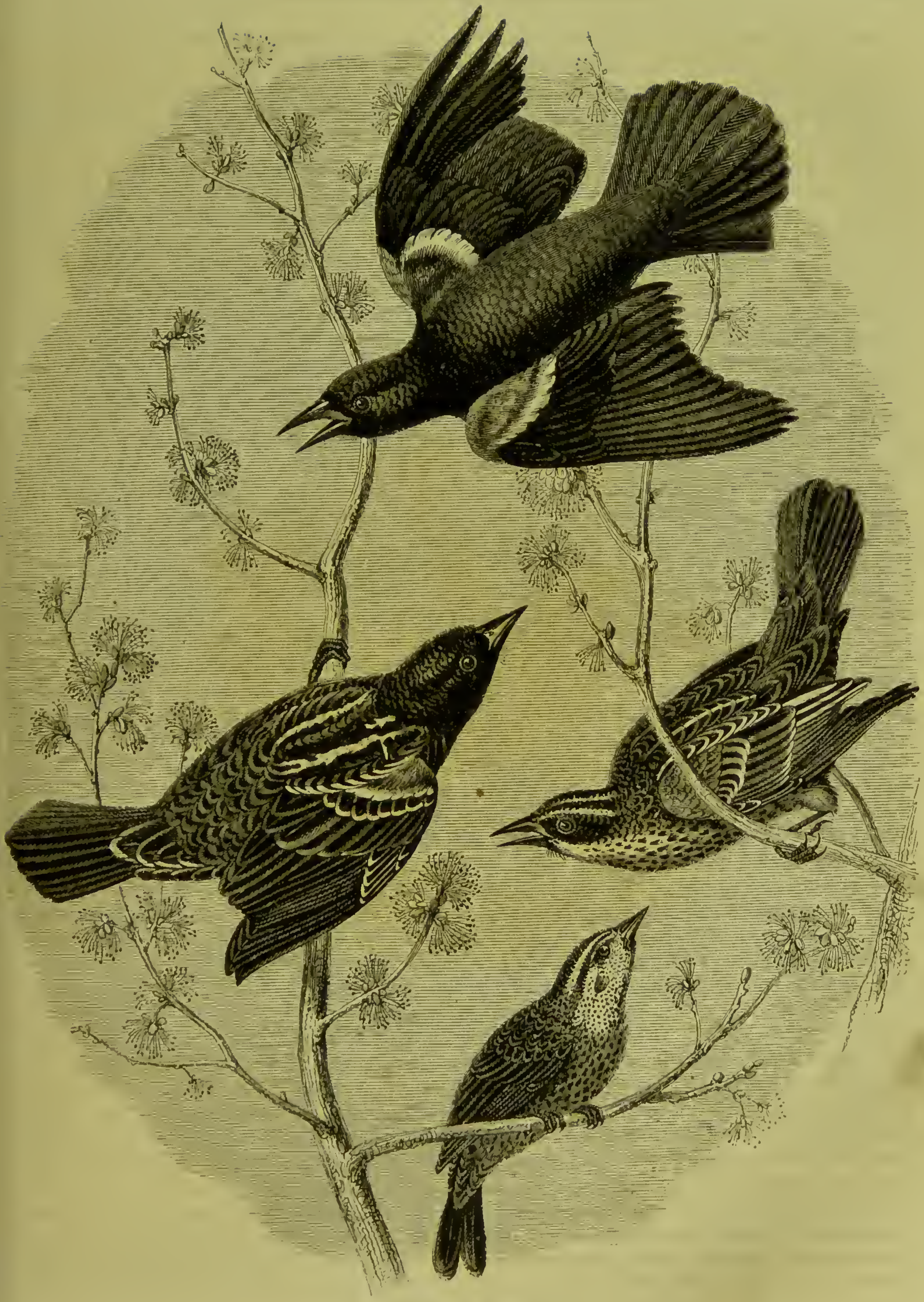
It lays twice in the year, seven eggs each time, whose colour is ashy-green. The young, before moulting, are of rather a yellowish soot colour than pure black. The beak is dark-brown; those which are bred from the nest, and which are easily reared on white bread soaked in milk, repeat the airs they are taught in a stronger and more distinct manner than bullfinches and linnets. They can, indeed, repeat a succession of couplets without changing or mixing them. In Voigtlande, the peasants use the starling like domestic pigeons; they eat the young, which they take before they can fly: by this means they obtain three broods, but they do not touch the last, both in order not to discourage and drive away the father and mother, and not to diminish this branch of economy. Starlings have been seen to build in dwelling-houses, in an earthen vase with a long neck, appropriated to the purpose.

It is principally in autumn, and in places filled with reeds, that the bird-catchers take great numbers of starlings in nets prepared for the purpose. They may also be procured by means of an osier fish-net placed among the reeds which they frequent in the evening, and baited with cherries. Though this means is limited, as many as a hundred have been procured in one night.

In Thuringia it is never attempted to catch them for the house, except in the month of March, when snow falls after their arrival. For this purpose, limed twigs are put in places cleared from snow, and beside swampy ditches, with some earth-worms for a snare, into which they fall as easily as chickens.

STARLINGS.

The starling becomes wonderfully familiar in the house; as docile and cunning as a dog, he is always gay, wakeful, soon knows all the inhabitants of the house, remarks their motions and air, and adapts himself to their humours. In his solemn tottering step, he appears to go stupidly forward; but nothing escapes his eye. He learns to pronounce words without having his tongue cut, which proves the uselessness of this cruel operation. He repeats correctly the airs which are taught him, as does also the female, imitates the cries of men and animals, and the songs of all the birds in the room with him. It must be owned that his acquirements are very uncertain; he forgets as fast as he learns, or he mixes up the old and the new in utter confusion; therefore, if it is wished to teach him an air, or to pronounce some words clearly and distinctly, it is absolutely necessary to separate him from other birds and animals, in a room where he can hear nothing else. Not only are the young susceptible of these instructions, but even the oldest show astonishing docility.



RED-WINGED STARLINGS.

THE RED-WINGED STARLING.*

THESE birds are found in immense flocks throughout the lower parts of Virginia, both Carolinas, Georgia, and Louisiana—particularly near the sea-coast, and in the vicinity of large rice and corn-fields.

The aërial evolutions of large numbers of these birds are very curious. Sometimes they appear like a large black cloud driving before the wind, varying its shape every moment; sometimes rising suddenly from the fields with a noise said to resemble thunder, while the glittering of innumerable wings of the brightest vermilion amid the black cloud they form, produces, on such occasions, a very splendid effect. Then, descending like a torrent, and covering the branches of some detached grove or clump of trees, the whole congregated multitude will commence a general concert or chorus, which may sometimes be plainly distinguished at the distance of more than two miles; and which, if heard at an interval of about a quarter of a mile, with a slight breeze to swell and soften the flow of the cadences, is stated to be grand, if not sublime. The entire winter season, which, with most birds, is spent in struggling to maintain life in silent melancholy, is, with the red-wings, a continual carnival; for as soon as the profuse gleanings of the old rice, corn, and buck-wheat fields have supplied them with food, of which there is abundance, they rise to their aërial manœuvres, or to rehearse their grand vocal entertainments.

About the middle of March they begin to enter Pennsylvania. They appear in small but numerous parties, and from daybreak to eight or nine o'clock in the evening, chattering to each other as they fly along, and, despite the destructive character of their visit, their presence gives cheerful promise of returning spring and beauty. They select their old haunts, preferring meadows, creeks, swamps, and ponds, till about the middle of April, when they separate into pairs, and in two or three weeks begin to build their nests. A favourite spot for this purpose is a thicket of alder bushes, a detached bush in a meadow of high grass, or a tuft of rank rushes or grass, especial regard being paid to such neighbourhoods as have swamps, meadows, or other watering-places. When the nest is built in a bush, it is generally composed outwardly of wet rushes, picked from the swamp, and long, tough grass in large quantities, the whole being lined with very fine bent. The rushes forming the exterior are generally extended to several of the adjoining twigs, round which they are repeatedly and securely twisted—an indispensable precaution, on account of the flexible nature of the bushes in which it is placed. The same precaution is observed when a tuft of grass or rushes is selected, the tops being fastened together and intertwined with the materials of which the nest is formed, with the stalks of rushes around. When placed upon the ground, less care and fewer materials are necessary. It is not uncommon to find several nests in the same thicket, within a few feet of each other.

As is the case with most other birds which build in low situations, the males exhibit the most violent apprehension on the approach of an intruder, and this is especially the case after the young are hatched. Like the lapwings of Europe, they fly to meet the invader, hovering at a slight elevation above him, and uttering loud cries of distress; and while in this position, displaying to great advantage the rich glowing scarlet of their wings, which is heightened by the jetty-black of their general plumage.

But while the devastation committed by these birds is very great, the services which they render must not be overlooked. Half a truth is no more *the* truth in natural history than it is in morals; and those who utterly denounce and would entirely extirpate the Red-winged Starling, overlook some important considerations. For a considerable period the food of these birds consists of various kinds of caterpillars, which, though silent and unostentatious in their movements, are yet the fatal enemies of all vegetation. For these the starlings search with great diligence, not only in the ground, but at the roots of plants, in meadows, and among buds and blossoms; and the multitudes which they destroy of these is immense. Wilson makes the computation that, supposing each bird, on an average, devours fifty of these larvæ in a day—a very moderate estimate—a single pair, in the four months during which they seek them, will consume upwards of twelve thousand. Now it is believed that not less than a million pair of these birds are distributed over the whole extent of the United States in summer, whose food, being nearly the same, would swell the amount of vermin destroyed to twelve thousand millions. But the number of young birds may be fairly estimated at double that of their parents; and, as these are constantly fed on larvæ for at least three weeks, making only the same allowance for them as for the old ones, their share would amount to four thousand two hundred millions; making a grand total of sixteen thousand two hundred millions of noxious insects destroyed in the space of four months by this single species. The ravages of such a host of the enemies of vegetation, if permitted to go forth unchecked, would soon spread famine and desolation over the most fruitful and best cultivated country on earth: and yet these data are founded on the best authenticated facts.

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* Sturnus Predatorius: Wilson.

Towards the middle of August the young birds begin to fly in flocks, and at that age very much resemble the female, with the exception of some reddish or orange which marks the shoulders of the male. It is also frequently found that at this time the young birds chiefly associate by themselves, there being sometimes not more than two or three old males in a flock of many thousands. By the end of the second week of the following month the flocks of birds have become very numerous and formidable; and they make most destructive assaults on the soft, succulent young ears of Indian corn; and, reinforced by constantly-increasing hosts from all parts of the interior, they pour down on the low countries in prodigious multitudes. Here they are seen, like vast clouds, wheeling and driving over the meadows and devoted corn-fields, darkening the air with their numbers. Then commences the work of destruction on the corn, the husks of which, though composed of numerous envelopes of closely-wrapped leaves, are soon completely or partially torn off; while from all quarters myriads continue to pour down like a tempest, blackening half an acre at a time; and if not disturbed, repeat their depredations, till little remains but the cob and the shrivelled skins of the grain: what little is left of the tender ear, being exposed to the rains and weather, is generally much injured. All the attacks and havoc made among them at this time with the gun, and by the hawks—several species of which are their constant attendants—have little effect on the remainder. When the hawks make a sweep among them, they suddenly open on all sides, but rarely in time to disappoint them of their victims; and, though repeatedly fired at, with mortal effect, they only remove from one field to an adjoining one, or to another quarter of the same inclosure. From dawn to nearly sunset, this open and daring devastation is carried on, under the eye of the proprietor; and a farmer, who has any considerable extent of corn, would require half-a-dozen men, at least, with guns, to guard it; and even then, all their vigilance and activity would not prevent a good tithe from becoming the prey of the marauders. The Indians, who usually plant their corn in one general field, keep all the young boys of the village all day patrolling round and among it; and each being furnished with bow and arrows, with which they are very expert, they generally contrive to destroy great numbers of them.

This scene of pillage is, however, principally confined to the low countries on the sea-board, or near the extensive flats which border the larger rivers. By the end of September, too, the corn has acquired its hard shelly coat, and the seeds of the reeds or wild oats, with many other plants that abound along the river shores, being now ripe, and in great abundance, they present a new and more extensive field for these marauding multitudes. The reeds, also, being often in almost inapproachable morasses, supply them with convenient roosting-places, and thither they repair every evening. In some places, where the reeds become dry, advantage is taken of this circumstance to destroy these birds, by a party secretly approaching the place under cover of a dark night, and setting fire to the reeds in several places at once, which, being soon enveloped in a general flame, the uproar among these birds becomes universal; and, by the light of the conflagration, they are shot down in vast numbers, while hovering and screaming about the place. Sometimes straw is used for the same purpose, which is previously strewed near the reeds and alder-bushes where they are known to roost; this being set on fire, the havoc among the birds from their foes is enormous; the party returns at day to pick up the slaughtered game.

THE SATIN BOWER BIRD.*

THIS very remarkable bird, about the size of our jay or jackdaw, is placed among the *Sturnidæ*. The adult male has the whole of the plumage of a deep, shining, blue-black, closely resembling satin, with the exception of the primary feathers, which are of a deep velvety-black, and the wing coverts, secondaries, and tail-feathers, which are also velvety-black, tipped with a shining blue-black lustre. The female is of a grayish-green above, with the wings and tail dark sulphur-brown; the under parts are lighter, with a wash of yellow, and variegated with crescent-shaped marks of brown.

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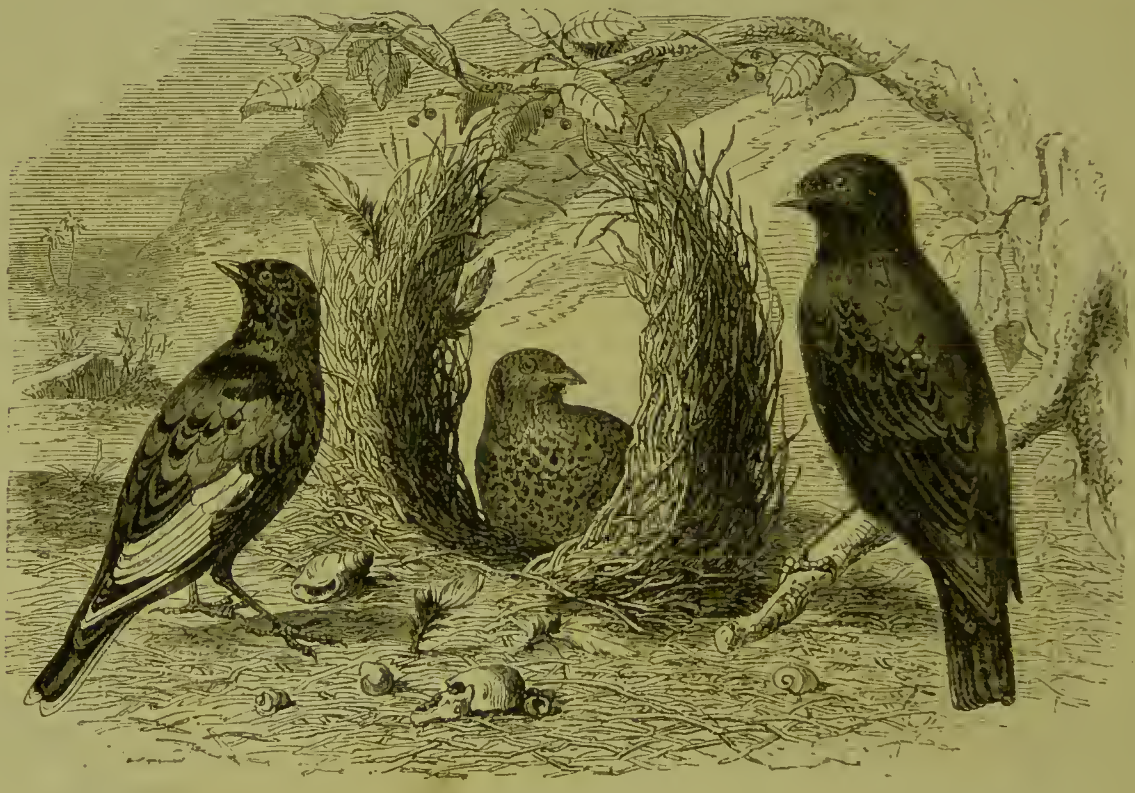
* Ptilonorhynchus holosericeus.

It is to Mr. Gould, of rare eminence as a naturalist, that we are indebted for our knowledge of this bird. Independently of numerous berry-bearing plants and shrubs, the brushes it inhabits in Australia are studded with enormous fig-trees, some of them towering to the height of two hundred feet. Among the lofty branches of these giants of the forest the satin bower bird, and several species of pigeons, find, in the small wild fig with which the branches are laden, an abundant supply of a favourite food. This species, however, commits considerable depredations on any ripening corn, near the localities it frequents.

The most singular point in the history of this bird is, that it constructs on the ground a bower or arbour, which is not used as a nest, but as a playing ground. These bowers are usually placed under the shelter of the branches of some overhanging tree, in the most retired part of the forest. Their structure is as follows: An extensive and rather convex floor or base is laid, composed of sticks firmly interwoven together. About the centre of the floor the bower is built, in the form of two parallel walls, at a little distance apart, consisting of slender, flexible twigs and stems, so arranged as to curve inwards, and nearly meet at the top, forming an avenue arched overhead. The arrangement of the arched twigs is such that the forks and projections are always presented outwardly, the interior being free from any obstruction to the passage of the birds through the avenue. The interest of this curious bower is much enhanced by the manner in which it is decorated, at and near the entrance, with the most gaily-coloured articles that can be collected, such as the blue tail-feathers of the Rosehill and Pennanteau parrots, and the shells of snails. The structure is adorned with beautiful feathers; some of them are stuck in among the twigs, while others, together with bleached bones and shells, are strewed about near the entrance. Mr. Gould has also described the bowers of other birds having the same remarkable instinct.



THE SATIN BOWER BIRD.

Mr. Gould obtained his specimens most readily by watching at the water-holes where the birds came to drink; and on one occasion, near the termination of a long drought, he was guided by a native to a deep basin in a rock where water, the produce of many antecedent months, still remained. Numbers of the spotted bower birds, honeysuckers, and parrots sought this welcome reservoir, which had seldom, if ever before, reflected a white face. Mr. Gould's presence was regarded with suspicion by the winged frequenters of this attractive spot; but while he remained lying on the ground, perfectly motionless, though close to the water, their wants overpowered their misgivings, and they would dash down past him and eagerly take their fill, although an enormous black snake was lying coiled upon a piece of wood near the edge of the pool. At this interesting spot Mr. Gould remained for three days. The spotted bower birds were the most numerous of the thirsty assemblage there congregated, and the most shy, and yet he had the satisfaction of frequently seeing six or eight of them displaying their beautiful necks as they were perched within a few feet of him. He states that the scanty supply of water remaining in the cavity must soon have been exhausted by the thousands of birds that daily resorted to it, if the rains which had so long been suspended had not descended in torrents.

Some of these birds, as well as their bowers, have been, for years, submitted to public inspection in the Zoological Gardens and also in the British Museum.

THE DEAD RAVEN.

Another family is that of the Crows,* having the bill strong, slightly cultirostral, or more or less compressed; the gape or commissure is straight; the nostrils are covered with stiff, bristle-like feathers, directed forwards. Of these we shall give several examples.

THE RAVEN.†

THE Raven, which is the largest species of its order, is black, but there are purplish reflections on the upper part of the body, and greenish tints underneath. The female is distinguished by a colour less deep, by a weaker bill, and by being rather smaller than the male. The plumage of the young, also, is not so decided a black, and it is without reflections. The tongue is black, cylindrical at the base, flatted and forked at the extremity; the œsophagus is dilated at the point of its junction with the stomach, and forms a sort of gizzard, of which this bird is otherwise destitute. The stomach of the raven is neither muscular, like that of the gallinaceous and other birds, nor is it like that of the birds of prey and of quadrupeds, but, in point of solidity of its coats, is intermediate between the two. Thus, a small tinned tube will not be altered in shape in the stomach of this bird, though it will be in that of a pigeon ; but a tube of lead, being a softer metal, will be flatted in the stomach of a raven, though an ordinary membranaceous stomach will have no such effect upon it. In accordance with this comparative weakness of stomach in these birds, we find that when they take grain, they break it by means of the bill or feet before they swallow it.

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* Corvidæ.

† Corvus corax.

Carrion and putrid animal matter, which they can smell at a great distance, forms the basis of the food of these birds ; when such, however, is not forthcoming, they live on fruits, grain, insects, dead fish, and molluscous animals, whose shells they break against stones. It is said that they will at times attack living animals, as rats, partridges, and frogs, and that falling on the back of the larger sort, as asses and buffaloes, will seriously injure them by repeated strokes of the bill. The fœtid nature of their food renders these birds unfit for the table. They were unclean to the Jews, and are generally considered in a similar light by most savage nations.

Ravens, when threatened or attacked, fear neither cats nor dogs ; and render themselves formidable, not merely to children, but even to men, whose legs they will peck at and wound, with some effect. Notwithstanding their courage, however, they may be brought to associate with man ; and they have been employed for purposes of falconry.

They are also greatly attached to one another, and live, in general, in pairs, each pair remaining connected for several years, probably for the whole period of their lives. They make their nests in the crevices of rocks, in holes towards the tops of deserted towers, and sometimes on the summit of an isolated tree. This nest, which is very large, is composed exteriorly of branches and roots ; bones of quadrupeds, or fragments of hard substances, form the second coat ; and the interior is lined with moss, &c. The female lays, about the month of March, five or six pale greenish and bluish eggs, lined and spotted with a neutral tint ; both the male and female sit, and the incubation lasts about twenty days. There may be generally found in the vicinity of these nests a considerable accumulation of grains, nuts, fruits, and other things, though it appears these hoards are rather made by the instinctive impulse of the bird, than for the use of the young. These at their birth are whitish.

It is said that the mother leaves the young for some time after their birth without nourishment, and that she prepares the first food they have for them in her stomach, in the manner of pigeons. As is generally the case with animals of a sort of domestic inclination, the male defends his young family with great courage and address, and will succeed in repelling the attacks of the kite.

The young are ready about the month of May to quit the nest. So long as they are but partially able to provide for themselves, the parents bring them food during the day, and every evening the family re-assemble in the nest, and this practice continues the whole summer, which has led to the presumption that they breed more than once in the year. Though not quick breeders, however, these birds are very long-lived. When the young have attained strength enough to provide altogether for themselves, the old birds drive them from their own adopted vicinity to seek an asylum elsewhere.

Some birds sit so close on their eggs, that no approach of danger can induce them to quit their nest. The ingenious author of the "Natural History of Selborne" gives a very interesting anecdote of this in the case of a raven :—"In a centre of a grove there stood an oak, which, though shapely and tall on the whole, bulged out into a large excrescence about the middle of the stem. On this a pair of ravens had fixed their residence for such a series of years, that the oak was distinguished by the title of the raven-tree. Many were the attempts of the neighbouring youth to get at this eyrie ; the difficulty whetted their inclinations, and each was ambitious of surmounting the arduous task. But when they arrived at the swelling, it jutted out so in their way, and was so far beyond their grasp, that the most daring lads were awed, and acknowledged the undertaking to be too hazardous. So the ravens built on, nest upon nest, in perfect security, till the fatal day arrived in which the wood was to be levelled. It was in the month of February, when these birds usually sit. The saw was applied to the butt, the wedges were inserted into the opening, the woods echoed to the heavy blows of the beetle or mallet ; the tree nodded to its fall ; but still the dam sat on. At last, when it gave way, the bird was flung from her nest; and, though her parental affection deserved a better fate, was whipped down by the twigs, which brought her dead to the ground."

Ravens abound in the fur countries, and visit the remotest islands of the Polar Seas. They frequent the barren grounds even in the most intense winter colds, their movements being chiefly directed by those of the herds of reindeer, musk oxen, and bison, which they follow, ready to assist in devouring such as are killed by beasts of prey or by accident. No sooner has a hunter slaughtered an animal, than they are seen coming from various quarters to feast on the offal; and considerable numbers constantly attend the fishing stations, where they show equal boldness and rapacity. The experienced native, when he sees from afar a flock of ravens wheeling in small circles, knows that a party of his countrymen, well provided with venison, are encamped on the spot, or that a band of wolves is preying on the carcase of some of the larger quadrupeds, and pushes on briskly, in the certain prospect of having his wants supplied.

The thievish habits of a tame raven are well known; but it is remarkable that, inhabiting in a wild state the most secluded and most peopled districts of America, it should exhibit the same disposition to carry off shining metallic bodies and other articles totally unfit for food, or to be used in the construction of its nest. Mr. Kendall, in crossing the height of land which divides the waters that flow towards Hudson's Bay from those which fall into the Arctic Sea, saw a raven flying off with something in its claws, pursued by a number of its clamorous companions. The bird being fired at, dropped the object of contention, which proved to be the lock of a chest.

The power which the raven has of clear articulation is well known. Mr. Swainson says, "One belonging to Mr. Henslow, of St. Albans, speaks so distinctly, that when first we heard it, we were actually deceived in thinking it was a human voice; and there is another at Chatham which has made equal proficiency, for, living in the vicinity of a guard-house, it has more than once turned out the guard, who thought they were called by the sentinel on duty."

THE ROOK.*

"Who," asks William Howitt, "that has been brought up in the country has not been accustomed from his infancy to hear the cawing of the rookery; to witness the active labour, and cares, and schemes of these birds in spring? has not stood by his father or any other old friend, while the young have been fetched down from the lofty elm by the cross-bow? has not run to fetch it as it fell? has not clambered into the green tree in which it has, perhaps, lodged in falling, and hooked it down? has not helped the keeper to carry to the house the black feathery bunch of young rooks thus shot, for the cook to convert into the most savoury of country pies; or to be dispatched in different directions as presents to friends? Who has not, on bright summer days, when the young have got abroad, seen them in almost every green oak, or on the tuft of every green meadow, when the country was all flowers and sweetness, with fluttering wings, demanding food from their busy parents? and in the still, broad, quiet sunshine of summer evenings, as he sat in garden arbour, or at open window, with the dear old friends of his youth, has not often seen them come soberly homewards from their day's wanderings in a rustling and jetty array, from whose wings the light of the setting sun glanced, seeking those ancient and towering trees, which had overspread the hall for ages? Who, in the days of warm feeling and expanding affections, when life was a long summer of happiness and gaiety—when, perhaps, the attachment of a life was growing—as he has ridden home in the sweet dusk of a June midnight, has not heard them in their lofty nest, half roused by the horse's tread, give a rustle, a caw, and then all quiet again? . . . . In short, what Englishman recalls the dear old home of his birth and his youth, with all its affections, and delights, and transactions; who recalls its garden-nooks, its bee-hives by the sunny wall, its fields, its woods, its friends, its favourite animals, its sorrows and its merriments, its gay meetings and its partings to meet there no more, everything that makes that spot what no other spot on earth besides ever can be by any magic, even the most powerful magic of love—and does not find the English rook a part of his retrospect, uttering its joyous, rough, John Bullish caw, or his laughable midnight muttering, insignificant as he is in himself, an indispensable dweller in the paradise of the past?"

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* Corvus frugilegus.

The Rook has a great analogy to the carrion crow, and, indeed, is not to be distinguished from it without considerable difficulty. The principal distinctive character consists in the nudity of the base of the bill and of the forehead, and upper part of the throat in the rook, which parts are covered with feathers in the carrion crow; but as even this is not observable in the young bird, it seems likely to be rather an artificial than a natural distinction, arising from the rook thrusting its beak into and raking the ground, and thus causing a trituration on the parts in question, which may efface the feathers. To recognise the rook, therefore, before its first moult, we must observe that its bill is longer than the head, and is entirely straight; while in the crow it is not longer than the head, and the upper mandible is bent at the point, and jagged towards the end on both sides; the feathers, moreover, of the front part of the neck are silky, and rounded at their end in the rook; but they are stiff and pointed in the crow. The iris also is hazel in the crow, but bluish in the present species. Rooks, however, do not feed on carrion, or the flesh of large animals, but confine themselves to grain, and the larvæ of insects, especially the chaffer. According as it feeds on these grubs, called in some places "rook-worms," it is a greater good than evil to the agriculturist.

THE ROOK.

These birds seem partial to our island, as they remain here the whole year; but in France, and most parts of Europe, especially to the south, they are birds of passage; and in Spain, it is said, are not known. Their gregarious disposition, particularly during incubation, on the tops of lofty trees, is a familiar fact. After the breeding season they disperse, and in a great measure abandon the trees in which they bred their young. The eggs, five in number, a little smaller than those of the crow, are bluish green, with dark blotches; they begin to build early in March, and the male and female sit by turns. White and pied varieties are sometimes seen.

Some years ago there were several large elm trees in the college garden behind the Ecclesiastical Court, in Doctors' Commons, in which a number of rooks had taken up their abode, forming, in appearance, a sort of *convocation* of aërial ecclesiastics. A young gentleman who lodged in an attic, and was their close neighbour, frequently entertained himself with thinning this covey of black game by means of a cross-bow. On the opposite side lived a curious old civilian, who, observing from his study that the rooks often dropped senseless from their perch, making no sign, nor any sign being made to his vision to account for the phenomenon, set his wits to work to discover the cause. It was, probably, during a profitless time of peace, and the doctor having plenty of leisure, weighed the matter over and over, till he was at length fully satisfied that he had made a great ornithological discovery, that its promulgation would give wings to his fame—a distinction which he seems to have highly appreciated.

His goose-quill and foolscap were quickly in requisition, and he actually wrote a treatise, stating circumstantially what he himself had seen, and in conclusion, giving it as the settled conviction of his mind, that rooks were subject to the *falling sickness!*

THE CARRION CROW.

THE CARRION CROW.*

"Say, weary bird, whose level flight
Thus, at the dusky hour of night,
Tends through the midway air,
Why yet beyond the verge of day
Is lengthen'd out thy dark delay,
Adding another to the hours of care?

"The wren within her mossy nest
Has hushed her little brood to rest;
The wild wood-pigeon, rock'd on high,
Has coo'd his last soft note of love,
And fondly nestles by his dove,
To guard their downy young from an inclement sky.

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* Corvus corone: Linnæus.

"Each twittering bill and busy wing,
  That flits through morning's humid spring,
Is still—listening perhaps so late
  To Philomel's enchanting lay,
  Who now, asham'd to sing by day,
Trills the sweet sorrows of her fate.

"Haste, bird, and nurse thy callow brood,
  They call on Heaven and thee for food,
Bleak—on some cliff's neglected tree;
  Haste, weary bird, thy lagging flight—
  It is the chilling hour of night,
Fit hour of rest for thee!"

THE most unpractised observer can scarcely fail to distinguish a crow, for the plumage, though generally dense and dark, is soft and lustrous, and the species bear a great resemblance to each other. They also exhibit corresponding instincts, being, if not shy, at least cunning and watchful. They are omnivorous in the fullest sense of the term, and will poke their beaks into everything they can find, from a boiled potato to a dead horse.

The Carrion Crow, which is spread over both the old and new continents, feeds, like the ravens, on putrid flesh; to which, however, it adds insects, worms, fine grain, fruit, and eggs. In winter it associates with the rooks and hooded crows, and may be seen, with them, on fresh turned earth, searching for worms, insects, and other larvæ. At the approach of night, they assemble in considerable flocks, and retire to the highest trees of the forest. Early in the spring, when the rooks quit the south of Europe in flocks, to build their elevated cities in the high trees in the north, the carrion crows separate into pairs, and proceed alone in the great work of nidification. The nest, like that of the rook, is constructed at the summit of a tree of slender branches, matted with clay and horse-dung, and lined within with fibres. The female lays four or five eggs of a palish green, with obscure spots and bars.

The old birds have great affection for their young, which remain a long time under their fostering care, and to which the parents have the address to carry the eggs of partridges in their bills. They lay but once in the year, unless the eggs or young be destroyed by accident. They will engage with the rapacious birds in defence of their young and eggs. It is said that the conjugal union of these birds continues during life.

The carrion crow will learn, when domesticated, to speak like the raven, and displays in its general habits no small sagacity. It will sometimes seize chickens from the poultry-yard, and will also destroy such small birds as it can find in the fowler's snare, which it escapes falling into itself, probably by the perfection of its sense of smell; bird-lime, or glue, and meat infused with nux-vomica, are used therefore to take them instead of the net.

White and other varieties are sometimes met with, especially in high latitudes, as in the ravens; indeed, a general analogy prevails between these species, in nearly all their characters, essential and indifferent.

The carrion crow is, perhaps, the most generally known and least beloved, of all our land birds; having neither melody of song, nor beauty of plumage, nor civility of manners to recommend him; on the contrary, he is branded as a thief and a plunderer. Hated as he is by the farmer, watched and persecuted by almost every bearer of a gun, who all triumph in his destruction, had not Heaven bestowed on him more than common intelligence and sagacity, there is reason to believe that the whole tribe would long ago have ceased to exist. The myriads of worms, moles, mice, caterpillars, grubs, and beetles, which he destroys, are altogether overlooked; but on account of his depredations among the poultry and game, no mercy is shown him.

A gentleman who resided on the Delaware, a few miles below Easton, had reared a crow, with whose tricks and society he used frequently to amuse himself. This crow lived long in the family, but at length disappeared, having, as was then supposed, been shot by some vagrant gunner, or destroyed by accident. About eleven months after this, as the gentleman one morning, in company with several others, was standing on the river shore, a number of crows happening to pass by, one of them left the flock, and flying directly towards the company, alighted on the gentleman's shoulder, and began to gabble away with great volubility, as one long absent friend naturally enough does on meeting with another. On recovering from his surprise, the gentleman instantly recognised his old acquaintance, and endeavoured, by several civil but sly manœuvres, to lay hold of him; but the crow, not altogether relishing quite so much familiarity, having now had a taste of the sweets of liberty, cautiously eluded all his attempts; and suddenly glancing his eye on his distant companions, mounted in the air after them, soon overtook and mingled with them, and was never afterwards seen to return.

THE HOODED CROW.*

Like the rook, this bird associates in numerous flocks, and is, perhaps, still more familiar with the haunts of man, preferring, especially in winter, the vicinity of our farms and hamlets, and picking up its food in the kennels and dunghills. Like the rooks also in several countries, it changes its abode twice a-year, appearing in flocks in the middle or at the end of autumn, and departing in a northerly direction about the beginning of spring. It visits the south of England in October, or the beginning of winter, arriving and departing with the woodcock, and retiring north, to breed, in the beginning of April. In the northern parts of the island it is more frequent than in the south; and in the Orkneys, Hebrides, and Shetland Islands, it is the only genuine crow, the rook and carrion being there unknown. In these districts, and in some parts of Scotland and Ireland, it is resident throughout the year. Where opportunities offer, it breeds in the pines and other large trees, in default of which it nestles in the cavities of rocks.

The female, which is rather smaller than the male, and of less lively hues, usually lays four, five, or six eggs, of a greenish blue, marked with many spots of blackish-brown. It pairs during the whole of the breeding season; and both parents are much attached to their offspring. They are remarked for their double cry, of which one is hollow, and well known, and the other shrill, and somewhat resembling the crowing of a cock. When other food is wanting, they will eat cranberries and other mountain fruits; in open fertile countries, they live much on grain, worms, and carrion; but they often resort to the sea-shores, and prey on the various animal matters thrown up by the tide. Frisch observes, that they are expert at picking fish-bones, and that, when water is discharged from ponds, they quickly perceive the fish which are left in them, and lose no time in darting on them. They not only attack the eyes of lambs and diseased sheep, but of horses that have got entangled in bogs. In the Faroe Islands, where they abound, they are particularly mischievous, picking the seed from the fields, digging up the newly-planted potatoes, destroying the barley before it is ripe, and carrying off goslings and ducklings, or the fish which is hung up to dry, to their young. In some parts of these islands, they assemble to about the number of twelve hundred in one place, and at one time, as if by concert. A few of the congregation sit with drooping heads, others seem as grave as judges, and others again are very bustling and noisy. The meeting breaks up in the course of an hour; and it is not uncommon to find one or two dead on the spot. These, according to the insinuation of Landt, are either *criminals punished for their offences*, or invalids that have died of some disorder. Low observes, that in the Orkneys, they meet together in spring, as if to deliberate on the important concerns of summer, and, after flying about in this collected state for eight or ten days, separate into pairs, and betake themselves to the mountains.

THE JACKDAW.†

The Jackdaw is a frequenter of the haunts of man, active, noisy, and familiar almost to impudence; but it is a lively bird; and though at times it may take a little grain, that is far more than compensated by the number of insects and worms that it destroys in the course of the year.

The jackdaw is the smallest of the tribe, being only about half the weight of the rook; but the wings are larger in proportion. It is about fourteen inches long, twenty-nine broad, and weighs between nine and ten ounces. The bill, feet, top of the head, and wing coverts, and secondary quills, are black; the back of the head and nape smoke-gray, and the irides the same, but much lighter; the remaining parts black with a grayish tinge on the upper side, and a bluish on the under. The black is variously glossed with blue and violet reflections. These are the ordinary colours; but like all birds that inhabit cultivated lands, and are of course affected by the differences to which cultivation gives rise, jackdaws vary considerably in colour, partly from age, partly not; sometimes the gray is nearly white, at other times the bird is black all over; and there are many slighter and intermediate variations.

Holes and chinks are the immediate places in which jackdaws nestle; but these must be elevated above the level ground, and the higher they are the bird likes them the better. It is probable that the original instinct is the protection of its eggs and young from the weasels. Rocks, the edges of neglected quarries, the projecting parapets of bridges, towers, steeples, ruins, and various other places, are the haunts of this bird.

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* Corvus cornix: Linnæus.

† Corvus monedula.

Another genus,* considered by Cuvier to belong to the shrikes, Vigors places among the crows. The following are its characters:—Bill hard, long, and strong, convex above, slightly hooked at the extremity, near which both mandibles are notched; nostrils lateral and longitudinal near the base; legs stout; outer toe joined to the middle one as far as the first joint; inner toe entirely free; hind toe elongated; claws strong and curved.

THE JACKDAW.

One of these birds is the Piping Crow,† common in New South Wales. M.M. Quoy and Gaimard, the able naturalists attached to Freycinet's expedition, saw numbers of them on the Blue Mountains, living gregariously in small troops. The bird brought home by Freycinet reached France alive, and, by its good-natured and amusing manners, became a great favourite on ship-board. It was a skilful mimic, and clucked and cackled like a hen; but its imitation of a young cock was complete. It had been trained to whistle airs, at Port Jackson, and some of these it appeared to forget, but recollected them on being prompted.

THE ALPINE CROW.‡

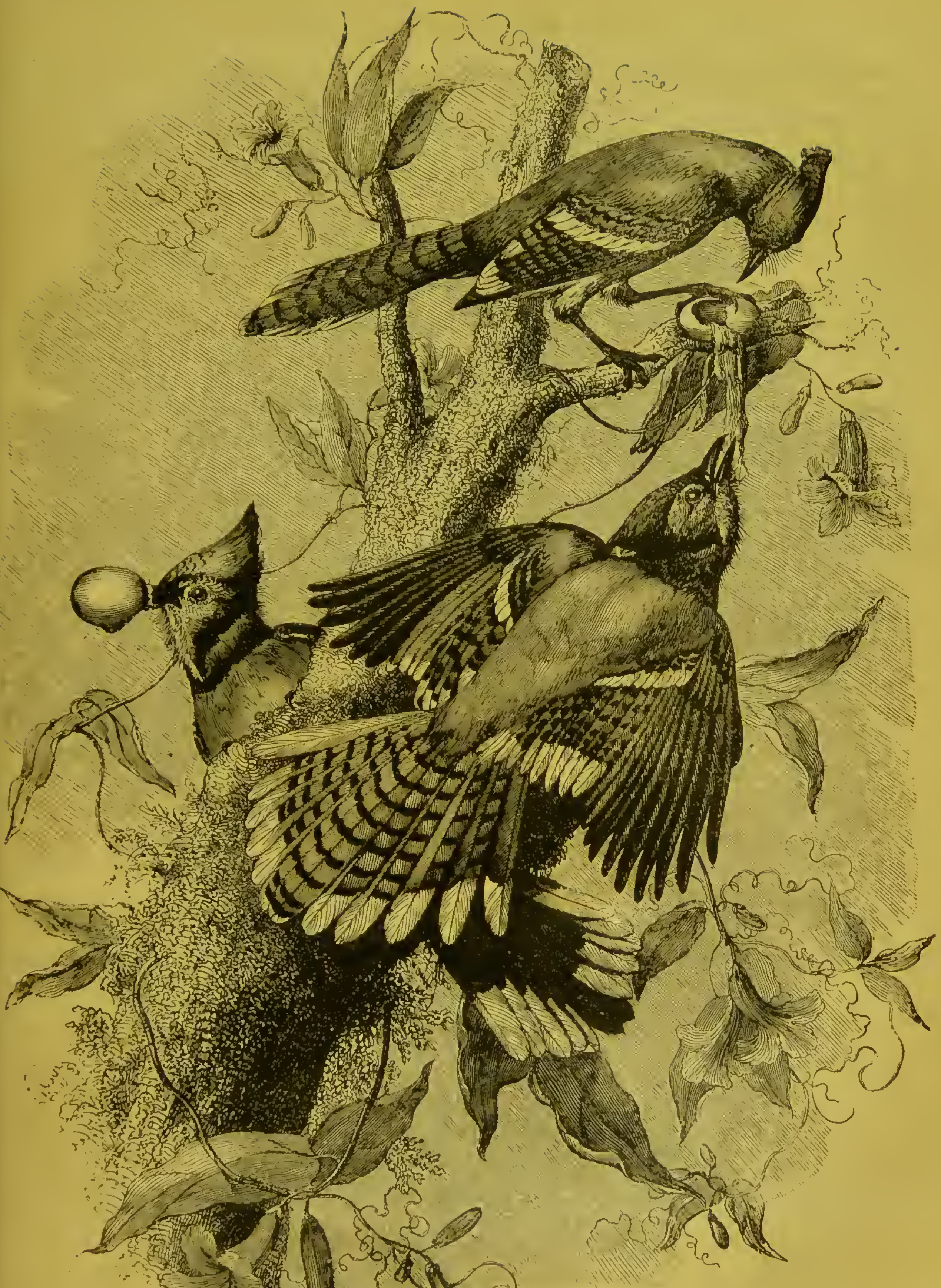
The Chocards,§ as they are called in France, have the compressed, arched, and sloped beak of the blackbirds, but their nostrils are covered with feathers, like those of the crows, to which they have been annexed. Such is the Alpine Chocard. Its hue is black, with the beak yellow, the feet at first brown, then yellow, and, in the adult state, red. It builds in the clefts of rocks of the higher

* Barita.

† Barita tibicen.

‡ Pyrrhocorax Alpinus.

§ Pyrrhocorax.



THE BLUE JAY.

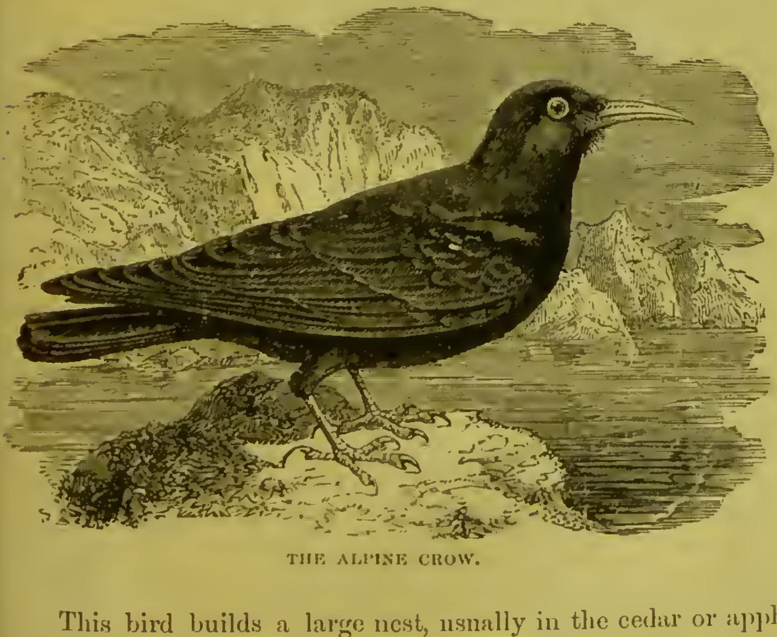
mountains, from whence these birds descend in large flocks into the valleys. They live on insects, snails, and fruits, and do not disdain carrion.

In India there is another bird of this kind, the Sicrin, distinguished by the barbless stalks, as long as the body, on each side, among the feathers which cover the ears.

THE PIPING CROW.

THE BLUE JAY.*

This bird is believed to be peculiar to North America, and is regarded with great interest on account of the brilliancy of his plumage, the address of his tones and gestures, and his strange loquacity. He is an almost universal inhabitant of the woods, frequenting the deepest recesses of the forest, where, in the spring, he pours forth his harmony in every thicket, and where his squalling voice often alarms the deer, to the great indignation of the hunter. He has great variety of undulations of voice, according to the humour of the moment, while there is scarcely a bird to whose peculiarities of song he cannot tune his note. Sometimes he indulges in soft chatterings like those of the duck, but no sooner does he discover the approach of a stranger, than he sets up a sudden and vehement outcry, flying off from the thick foliage of the cedar where he has been concealed, and screaming with all his might, as if calling all the feathered tribes of the neighbourhood to witness some outrageous usage he had received. The call-note which he utters to the female has been described by Wilson as easily mistaken by a stranger for the repeated "screakings" of an ungreased wheelbarrow.



THE ALPINE CROW.

This jay measures seven inches in length, the head being ornamented with a crest of light-blue or purple feathers, which he can elevate or depress, while a narrow line of black runs along the frontlet, rising on each side higher than the eye. A collar of black proceeding from the hind head, passes with a graceful curve down each side of the neck to the upper part of the breast, where it forms a crescent; the throat and belly are white; the greater wing-coverts are a rich blue; the interior sides of the wing-feathers are dusky-black; the tail is long and cuneiform; the breast and sides, under the wings, are a dirty-white, and the tongue, bill, legs, and claws are black.

This bird builds a large nest, usually in the cedar or apple-tree, and lines the interior with dry, fibrous roots. The male is especially careful not to be seen near the spot, that he may not betray the locality, and pays his visits as silently and secretly as possible.

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* Garrulus cristatus: Vieillot.

The Blue Jay is a most determined enemy of the owl, whom he seems to have peculiar gratification in tormenting. Let him discover the retreat of one of these birds, and at once summoning the whole feathered fraternity to his assistance, they attack him most vigorously on all sides, and make a noise which, on a still day, may be heard more than half a mile away; while the owl acknowledges every expression of opinion in reference to himself with a broad, goggling stare. At length, a sufficient number of assailants are collected to make it inconvenient to stay longer, and, followed by the entire retinue of his foes, the owl retreats beyond their jurisdiction.

The jay is by no means always a peaceable neighbour. Sometimes he may be seen prowling along the woods and among the thickets and hedgerows, plundering the eggs, and tearing the young piecemeal, to the consternation and grief of their parents and the spectators who approach the scene of desecration and slaughter. When pressed with hunger, he assaults little birds, and will even eat any fragment of animal matter or carrion he may be able to secure. In some cases, however, he is far from showing this ferocity of disposition. Mr. Wilson obtained one, and placed him in a cage with a female orchard oriole, who put on airs of alarm, as if she felt endangered and insulted by such intrusion; but, as the jay conducted himself in the most humble and condescending way, her ceremonious jealousy vanished, and they lived on terms of perfect harmony and good humour. But the eminent naturalist must tell the story in his own words:—"When the jay goes to drink, his messmate very imprudently jumps into the water to wash herself, throwing the water in showers over her companion, who bears it all patiently, venturing now and then to take a sip between every splash, without betraying the smallest token of irritation. On the contrary, he seems to take pleasure in his little fellow-prisoner, allowing her to pick (which she does very gently) about his whiskers, and to clean his claws from the minute fragments of chestnuts which happen to adhere to them. This attachment on the one part, and mild condescension on the other, may, perhaps, be partly the effect of mutual misfortunes, which are found not only to knit mankind, but many species of inferior animals, more closely together, and show that the disposition of the blue jay may be humanised, and rendered susceptible of affectionate impressions, even for those birds which, in a state of nature, he would have no hesitation in making a meal of."

This bird has a decided talent for mimicking, and also for teasing others of its feathered companions, from which it appears to derive no common satisfaction. One of the birds that is especially annoyed in this way is the little-hawk, whose cry the jay imitates when it meets him, and feigns the shrieks of a bird which has been captured and wounded. This noise brings other jays to the scene of action, and they all join in their annoyances of the hawk. The hawk, however, is not to be outdone, and at length singling out one of the more prominent of its tormentors, seizes it in an unguarded moment, and sacrifices it to his hunger and resentment. Instantly the tone of the other birds is changed, and with loud cries they proclaim the tragical conclusion of the sport.

The jays perform important functions in the economy of nature. Their chief employment in the autumnal season is foraging for the supply of their winter stores; and, in performing this necessary duty, they drop a great number of seeds over hedges and fields in their flight, where they alight to deposit them in nests, holes, and other places which they use as store-houses. These birds alone are able, in a few years, as we are emphatically assured, to replant all the cleared lands.

The blue jays associate together in considerable numbers in the months of September and October, when they may be found in groups of forty or fifty, hovering about the oaks in pursuit of their favourite food—the acorn. They seldom exceed this number, and even these are usually scattered with great irregularity over a considerable part of the wood; yet it is stated by Dr. Latham, that "the blue jays of North America often unite into flocks of 20,000 at least, which, alighting on a field of ten or twelve acres, soon lay waste the whole." Wilson positively affirms that a flock of blue jays of 20,000 would be as extraordinary an appearance in America, as the same number of magpies or cuckoos would be in Britain; and he states his firm conviction that the red-winged blackbirds,* in the environs of the river Delaware, alone devour and destroy more Indian corn than all the blue jays of North America.

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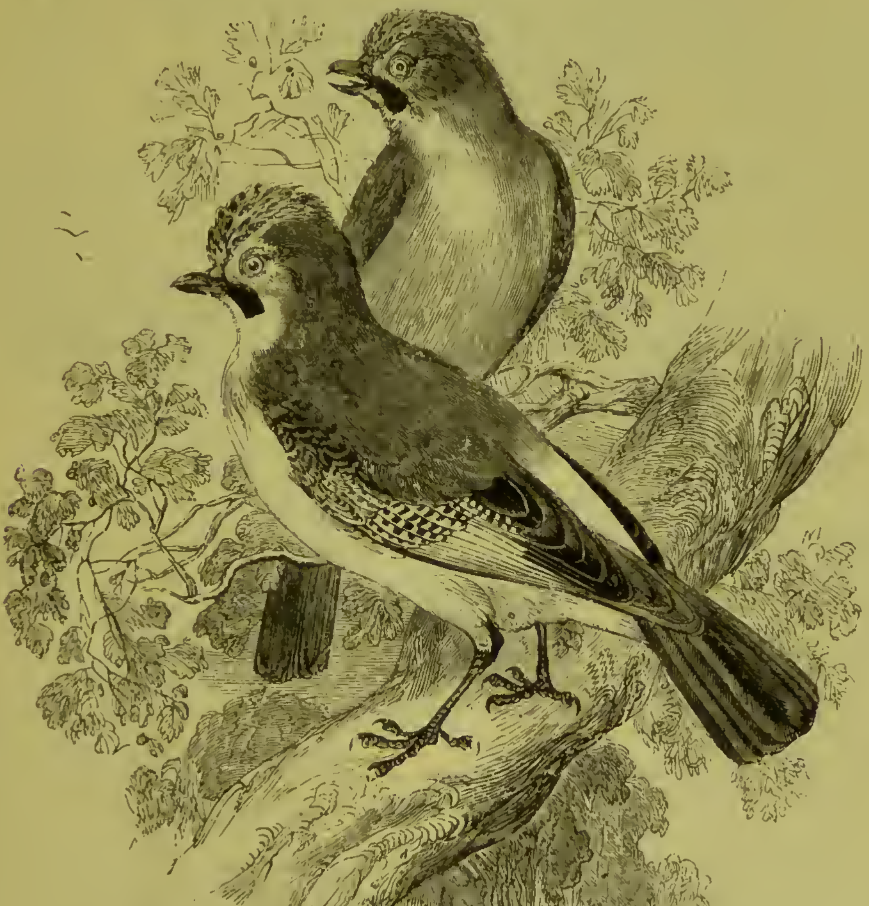
* Oriolus phœniceus.

THE COMMON JAY.*

The British species is one of the most ornamental of our indigenous birds. It dwells in woods, beyond the outskirts of which it seldom wanders. Its food consists of insects, fruits, and forest seeds. Species of this little group are found in every quarter of the known world, except New Holland.

The Jay builds its basket-like nest in trees or high coppice-wood and hedges, and lays five or six eggs of a dull whitish-olive, mottled very obscurely with pale brown. Towards the large end there are usually two or three black lines.

The jays rarely come into the open country, but make great havoc in gardens and cultivated grounds in the neighbourhood of woodlands. Their food is much less varied than that of the true crows, but they may still be styled omnivorous. Their plumage is generally gray and even brilliant; and there is a beautiful speculum on the wing. But showy as the jay is, it is much more frequently heard than seen; nor is it easy to observe it at all, for the more it is followed, the deeper does it plunge into the thick of the coppice. The best place for a full view of it is where peas or cherries grow near its haunts, as while it greedily feeds on these its wary habits will allow of its being longer watched than it may be under other circumstances.



THE COMMON JAY.

Jays neither flock nor have meetings similar to those of the magpies, and some of those crows that breed apart from each other; nor—though it has been observed in some instances—has it been fully proved that the young remain with the old birds after they are completely fledged and capable of finding their own food. They are, indeed, much more predatory than the magpies, though considerably smaller. They occasionally pounce on birds, and kill and devour them; they are very destructive to the eggs of small birds, and they will eagerly catch mice.

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* Garrulus glandarius.

One of the most remarkable peculiarities of the jays is the volubility of their sounds. The alarm-note the bird utters on the appearance of danger, or even of a stranger in its haunts, is extremely harsh, but it has a love-note singularly soft, "yet so low and apparently cautious, that it seems whispering to its mate, as if to hide their affections and labours from the other tenants of the grove. Even then it is very imitative, and though it does not attempt the songs of the warblers, it is very adroit at bleating, screaming, neighing, and, in short, imitating all the harsher sounds." Bewick says:—"We have heard one imitate the sound made by the action of a saw so exactly, that, though it was on a Sunday, we could hardly be persuaded that the person who kept it had not a carpenter at work in the house. Another, at the approach of cattle, had learned to hound a cur dog upon them, by whistling and calling upon him by his name. At last, during a severe frost, the dog was by that means excited to attack a cow big with calf, when the poor animal fell on the ice, and was much hurt; the jay was complained of as a nuisance, and its owner was obliged to destroy it."

Mudie, another careful observer, remarks: — "Words in which the letter *r* occurs are soonest learned, not only by the jay, but by most birds that can be taught to articulate. That is easily accounted for by the unyielding nature of the mandible, which forces the air to come out between the upper part of the tongue and the palate, on which that trills. A man cannot easily pronounce the *r* in any but Northumberland fashion, if he grins the while; and those who use the tongue simpering and softly, merely touch, but do not pronounce it."

Mr. Gould, who gives three figures of foreign jays in his "Century of Birds," justly remarks, that "the close affinity which the *Garrulus lanceolatus* bears to some species inhabiting the United States and Mexico is worthy of remark, as a corroboration of the fact so often insisted on, that similar forms of ornithology are found in countries widely separated from each other, whose temperatures are alike." Indeed, we are reminded by the last-mentioned bird of the *Garrulus cristatus*, the blue jay of America; while another, the *Garrulus bispecularis*, recalls the idea of the common jay.

Another very ornamental species—

"Proud of cærulean stains
From heaven's unsullied arch purloined"—

is that mentioned by Pallas as having been shot by Steller when Behring's crew landed upon the coast of America. It is the *Corvus Stelleri*, of Latham, by whom it was first described from a specimen in Sir Joseph Banks' collection from Nootka Sound. A larger and most magnificent bird is the Columbia jay (*Garrulus Bullokii*, Wagler; *Garrulus gubernatrix*, Temminck), figured in M. Audubon's splendid work; the colour is bright-blue, with a lofty crest of separate plumes, the throat and breast black, the abdomen whitish, and two of the central tail-feathers extending far beyond the others. It occurs chiefly in Mexico and California.

THE NUT-CRACKER.

Of the genus of birds* known by the name of Nutcracker, one species† is a native of Britain. The manners of this bird are said to resemble those of the jay, but other circumstances connected with its food and organisation bring it into alliance with the crows, to which family it is sometimes referred by ornithologists, though its precise place is a matter of doubt. Like the jay, it feeds on nuts and berries, as well as on the seeds of the pine, of which it appears to be very fond; but, like the wood-pecker, it climbs the trunks and branches of trees, tapping the bark with its bill, to start the insects and their larvæ that may lurk beneath, and devour them. It is said to crack nuts much in the same way as the nuthatch. The nest is formed in the hollows of trees which the bird is supposed to enlarge after the manner of the wood-pecker. The eggs are five or six in number, of a yellowish-white or gray, with a few spots of bright gray-brown.

THE CHOUGH.‡

This very handsome bird is locally distributed, but is, perhaps, not so rare as has been generally accounted. In Britain it only frequents sea-coasts, never venturing far inland; and, in this respect, seems to differ considerably from the birds on the continent, where Alpine inland districts are in part inhabited by them. In Britain, the rocky coasts of Devon and Cornwall, various parts of Wales, and some of the adjacent isles, are its southern localities; in Scotland, St. Abb's Head on the eastern side, and the shores of Wigtonshire and Galloway on the western, are frequented; and we learn that it has reached even the Hebrides. In Ireland, Mr. Thompson writes:—"The Chough frequents the sea-coast chiefly, and occurs in certain localities in the north, south, and east of Ireland." But that part where it appears to be most abundant is the Isle of Man—an island of considerable extent, and having precipitous coasts for at least two-thirds of its circumference. Round these shores it is so common, that nearly thirty specimens were once procured in a forenoon." The habits of the bird, as well as the flight and manner of alighting among the rocks and fissures, very considerably resemble those of the

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* Nucifraga.

† Nucifraga caryocatactes.

‡ Fregilus graculus: Selby.

THE NUT-CRACKER.

jackdaw, so much so, that when Mudie first enjoyed the satisfaction of seeing this bird on a part of the mainland where they were not so frequent, he mistook their flight for that of the last-named bird, and missed some opportunities of procuring what he then considered a very rare bird; a glimpse of their red legs first undeceived him. "During the breeding season," he says, "when we have chiefly seen these birds, we found them almost constantly on the coast, near the caves and fissures where the nests were placed; and they were very seldom seen more than a quarter of a mile inland; but they made excursions so far, alighting among the rocky parts of the upland sheep-pasture, and occasionally feeding and walking on the dry pasture itself, where they appeared to procure insects, their stomachs being chiefly at this time filled with coleoptera. It is also said to feed on grains and berries; and we are not aware of any particular food afforded by the rocky British coasts, which in that country so peculiarly attracts them to such localities, while on the Continent the Alpine ranges on the borders of the snow-lines are their usual haunts."

When the situation of the nests was approached, no great restlessness or anxiety was exhibited. They were placed in rents of the rocks, in the entrances of the caves, or in overhanging ledges of rock, built much in the same manner as those of the true crows. The eggs, from five to seven in number, are of a verditer or bluish-green, spotted and blotched with blackish-brown—some specimens nearly resembling those of the jackdaw, and apparently subject to nearly the same variation.

This beautiful species is entirely of a deep glossy-black above, with steel-blue and green reflections; the plumage on the head and neck is rather loose and tinted with purple; underneath, it is of a deep and uniform tint with less lustre. The bill is of a brilliant vermillion-red, strong, bending for the whole length, and without any trace of a notch; the plumes covering the nostrils are close and stiff, and appear as if rounded off with scissors on the bill. The legs and feet are of the same brilliant tint with the bill, and are strongly formed; the claws brownish-black, crooked, and strong; the development of the wings and tail large and powerful, the flight consequently light and buoyant; the length about fifteen inches. The bill and legs of the young do not show for some time the brilliant red colour

One of these birds was kept by Colonel Montague in his garden for some years, and of it he has given the following interesting account:—"His curiosity is beyond bounds, never failing to examine anything new to him. If the gardener is pruning, he examines the nail-box, carries off the nails, and scatters the shreds about. Should a ladder be left against the wall, he instantly mounts, and goes all round the top of the wall; and, if hungry, descends at a convenient place, and immediately travels to the kitchen window, where he makes an incessant knocking with his bill till he is fed and let in: if allowed to enter, his first endeavour is to get up-stairs; and, if not interrupted, goes as high as he can, and gets into my room in the attic storey; but his intention is to get upon the top of the house. He is excessively fond of being caressed, and would stand quietly for an hour to be smoothed: but resents an affront with violence and effect, by both bill and claws, and will hold so fast by the latter that he is with difficulty disengaged. He is extremely attached to one lady, upon the back of whose chair he will sit for hours; and is particularly fond of making one in a party at breakfast, or in a summer's evening at the tea-table in the shrubbery. His natural food is evidently the smallest insects; even the minute species he picks out of the crevices of the walls, and searches for them in summer with diligence. The common grasshopper is a great dainty, and the fern-chafer is another favourite morsel; these are swallowed whole: but if the great chafer be given to him, he places it under one foot, pulls it to pieces, and eats it piecemeal. Worms are wholly rejected; but flesh, raw or dressed, and bread, he eats greedily; and sometimes barley with the pheasants, and other granivorous birds occasionally turned into the gardens, and never refuses hemp-seed. He seldom attempts to hide the remainder of a meal. With a very considerable share of attachment, he is naturally pugnacious, and the hand that, a moment before had tendered him food and caresses, will repent an attempt to take him up. To children he has an utter aversion, and will scarcely suffer them to enter the garden Even strangers of any age are challenged vociferously: he approaches all with daring impudence; and so completely does the sight of strangers change his affection for the time, that even his favourites and best benefactors cannot touch him with impunity in these moments of evident displeasure."

"The Cornish chough is," says Pennant, "active, restless, and thieving; much taken with glitter, and so meddling as not to be trusted where things of consequence lie. It is very apt to catch up bits of lighted sticks, so that there are instances of houses being set on fire by its means, which is the reason why Camden calls it *Incendiaria avis.*"

THE MAGPIE.*

The Magpies are of smaller dimensions than the crows, properly so called, and their tails, instead of being either round or square, are long and graduated. Their dispositions, however, are equally omnivorous, and they are distinguished by the same sly and furtive cunning. There is only a single European species, our common British kind (*Corvus Pica :* Linnæus), which occurs all over Europe, and is well known in North America and in some parts of Asia. Many beautiful species occur in China, and other eastern countries ; such, for example, as the red-billed pie (*Pica erythrorhyncha :* Gould). Its size exceeds that of our common kind, and the great length of its tail bestows upon it a still more slender and elegant aspect. The prevailing colours are blue, with bars of black and white. It is often kept in aviaries, where it is highly esteemed on account both of its docility and beauty. This species, likewise, inhabits the Himalaya mountains, and there is reason to believe that it is fierce and tyrannical in a state of nature. Mr. Shore states, that one which he kept in captivity, although it refused other food, pounced ferociously upon living birds, which were presented by way of experiment, and eagerly devoured them. When seen amid the foliage of trees, it forms an ornamental and conspicuous object, flitting from bough to bough, its long and flowing tail waving in the wind, and its whole form full of vivacity and grace. The Chinese magpie (*Pica sinensis*), made known by the researches of General Hardwicke, seems widely extended over tracts of land of very various character as to height and situation. It inhabits the higher portions of the Himalayas, the plains of their base, and a great part of the Chinese empire.

"This bird," says Sir J. Richardson, "so common in Europe, is equally plentiful in the prairie-lands of America ; but it is singular, that though it abounds on the shores of Sweden, and other maritime parts of the Old World, it is very rare on the Atlantic coasts of America, or near Hudson's Bay ; only stray individuals passing to the eastward of the Mississippi or Lake Winnipeg. Mr. Say informs us that it winters on the Missouri, and takes its departure northward on the 23rd of March. It does not entirely quit the banks of the Saskatchewan even in winter, but is much more frequent in summer. On comparing its eggs with those of the European bird, they are found to be larger and narrower ; and though the colours are the same, the blotches are larger and more diffused. The manners of the American bird are precisely the same as those we are accustomed to observe in the English one." Mr. Swainson adds, that he has been able to compare English and Arctic specimens with one from the interior of China, communicated to him by Dr. Gray, so eminent in zoology and botany, and that he cannot perceive the slightest difference to indicate a variety, much less a species.

The common magpie is the type of Cuvier's sub-genus of Pica, distinguished by the convex upper mandible, and the long and cuniform tail. This, in the magpie, has the two middle feathers of the same length, but the side feathers decrease rapidly in succession ; about the neck the feathers are loose. It is one of the most beautiful species of this country, but loses much of its lustre in a state of captivity. The magpie is very common in England, and feeds both on animal and vegetable substances, frequently killing young ducks and chickens. It is said also occasionally to pick out the eyes of lambs, hares, &c., if weak ; it also eats insects, fruits, and even grain.

No birds display more industry in the construction of their nests ; they generally select the summit of the highest trees, especially if standing alone or in a row ; but in forests or very retired situations, they sometimes choose a mere bush for the purpose. The male and female begin this work together in February, placing the nest not, like the rook, in full sight of all from the ground, but so enveloped and surrounded with branches, that when the leaves appear the nest is concealed. Thus—

> "The thievish pie, in two-fold colours clad,
> Roofs o'er her curious nest with fern-wreath'd twigs,
> And side-long forms her curious door : she dreads
> The talon'd kite, or pouncing hawk : savage
> Herself—with craft suspicion ever dwells."

The nest is made of small branches well interlaced together, leaving an aperture only in the side. The bottom of the nest is furnished with a matting of soft and flexible roots ; and although the diameter of the inside of the nest does not much exceed six inches, it is upwards of two feet on the outside. It is said to occupy the birds two months to build this nest, and M. Vieillot has observed, that if the nest is destroyed, or the birds are prevented from finishing it, they either content themselves with an old nest of their own species, or take to an old crow's nest after repairing the outside. The same gentleman has also noticed that, at the early part of the breeding season, each pair of these birds begin more nests than one, though they finish that only in which the eggs are deposited.

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* Corvus pica : Pennant.

Ordinarily they have but one brood in a year; but if their young be destroyed, they will sometimes have a second and even a third. The eggs, seven or eight in number, are yellowish-white spotted with brown or gray. The male and female sit alternately, and the incubation continues about fourteen days. The young are born blind, and remain so several days. The parents display great care of them, and continue their attentions a considerable time.

"Whilst I was travelling in Scotland," says the Rev. John Hall, "as I was one day amusing myself with the objects within my view, on the road between Huntley and Portsoy, I observed two magpies hopping round a gooseberry bush, in a small garden, near a poor-looking house, in a peculiar manner, and flying out and into the bush. I stepped aside to see what they were doing, and found, from the poor man and his wife, that as there are no trees all around for some miles, these magpies, during several succeeding years, had built their nest, and brought up their young, in this bush; and that foxes, cats, hawks, and other creatures might not interrupt them, they had barricaded, not only their nest, but had encircled the bush with briers and thorns in a formidable manner; nay, so completely, that it would have cost even a fox, cunning as he is, some days' labour to get into the nest.

"The materials in the inside of the nest were soft, warm, and comfortable; but all on the outside so rough, so strong, and firmly entwined with the bush, that without a hedge-knife, hatch-bill, or something of the kind, even a man could not, without much pain and trouble, get at their young; for from the outside to the inside of the nest extended as long as my arm.

"They fed the young brood with frogs, mice, worms, or anything living within their power to subdue. It once happened that one of the magpies having seized a rat, which it was not able to kill, one of the young ones came out of the nest to its mother and the rat, while they were fighting on the outside of the bush, and assisted her to kill it, which they were not able to accomplish, till the father, arriving with a dead mouse, also lent his aid.

"These magpies had been faithful to one another for several summers, and drove off their young, as well as every one else that attempted to take possession of their nest. This they carefully repaired and fortified in the spring, with strong, rough, prickly sticks, that they sometimes brought to it by uniting their force, one at each end pulling it along, when they were not able to lift it from the ground."

Many of the poets allude to the talking powers of this bird. Thus Gisborne says, in his "Walks in a Forest"—

"From bough to bough the restless magpie roves,
And chatters as she flies;"

and Chaucer, in his "Canterbury Tales," thus gives two traits of the miller's wife—

"And she was proud and pert as is a pie."

It is related that an eminent physician attended a sick child in a very humble family, until she was restored to health, when a domestic conference took place as to what acknowledgment could be offered for his kindness. It was determined at length that the mother should present to him their favourite bird—a magpie—which was indeed all she had to give. She therefore promptly undertook the task, and duly expressing their sense of obligation, expatiated on the qualities of the wonderful bird, and on the affection they all had for him. Here, however, was a difficulty: to accept the bird would be to admit a pest into the doctor's quiet home; to refuse it would, under the circumstances, inflict pain; but the difficulty was at once surmounted by the physician's shrewdness and kindness. "I am much obliged to you, my good woman," he said; "he is certainly a very handsome and sagacious bird, and you shall have a shilling a week for keeping it for me."

Alluding to the use of magpies in hawking, Sir John Sebright says: "Nothing can be more

THE MAGPIE.

animating than this sport; it is, in my opinion, far superior to every other kind of hawking. The object of the chase is fully a match for its pursuers—a requisite absolutely necessary to give an interest to any sport of this kind; and it has the advantage of giving full employment to the company, which is not the case in partridge hawking. A down or common, where low trees or thorn bushes are dispersed at the distance of from thirty to fifty yards apart, is the place best calculated for this diversion. When a magpie is seen at a distance, a hawk is immediately to be cast off. The magpie will take refuge in a bush the moment he sees the falcon, and will remain there until the falcon arrives, with the hawk waiting on in the air. The magpie is to be driven from his retreat; and the hawk, if at a good pitch, will stoop at him as he passes to another bush, from whence he is to be driven in the same way, another hawk having been previously cast off, so that one or the other may always be so situated as to attack him to advantage. The second hawk is necessary, for the magpie shifts with great cunning and dexterity to avoid the stoop; and when hard pressed, owing to the bushes being rather far apart, will pass under the bellies of the horses, flutter along a cart-rut, and avail himself of every little inequality of the ground in order to escape. Four or five assistants, besides the falconer, who should attend solely to his hawks, are required for this sport. They should be well mounted, and provided with whips; for the magpie cannot be driven from a bush by a stick; but the crack of a whip will force him to leave it, even when he is so tired as hardly to be able to fly. The magpie will always endeavour to make his way to some strong cover; care, therefore, must be taken to counteract him, and to drive him to that part of the ground where the bushes are furthest from each other. It is not easy to take a magpie in a hedge. Some of the horsemen must be on each side of it; some must ride behind, and some before him; for unless compelled to rise, by being surrounded on all sides, he will flutter along the hedge, so as to shelter himself from the stoop of the falcon. Many requisites are necessary to afford this sport in perfection:—a favourable country, good hawks, and able assistants."

PICA VAGABUNDA.—VIEILLOT.

With the Pies is usually placed the *Pica vagabunda*, a species found in the East.

The Ternia have, with the carriage and tail of the Pies, an elevated bill, with the upper mandible gibbous, and the base furnished with velvety feathers, almost like the Birds of Paradise.

THE RICE-BIRD.[*]

This well-known bird, called also the Paddy Bird, Paddee Bird, or Java Sparrow, whose plumage is well described by Buffon as being so well arranged that no one feather passes another, whilst all appear covered with that kind of bloom which is visible on plums, giving them a beautiful tint, has the bill very much developed.

Its plumage is bloomy lead-coloured; the head and tail are black; the bill is red; the cheeks in the male, snowy; and the legs of a flesh colour. In Java and other parts of Asia it is in bad repute, on account of the ravages it commits in the rice-fields, with its powerful and sharp bill. It is often brought alive to this country, and confined in aviaries, for the sake of its elegant shape and graceful hues; but its song is short and monotonous.

One family of Tenuirostral birds consists of the Honey-Suckers.[†] They are chiefly confined to Australia, where they abound in every variety of form, and in an apparently inexhaustible multitude of species, finding, as they do, a sufficient and never-failing support in the luxuriant vegetation of that country.

THE HONEY-SUCKER OF NEW HOLLAND.[‡]

"This bird," says Mr. Caley, "is most frequently met with in the trees growing in scrubs, where the different species of *Banksia* are found, the flowers of which, I have reason to think, afford it a sustenance during winter. In the summer I have shot it when sucking the flowers of *Leptospermum flavescens.* In the scrubs about Paramatta it is very common."

[*] Loxia oryzivora: Linnæus.

[†] Meliphagidæ.

[‡] Meliphaga Novæ Hollandiæ.

THE GREAT EMERALD BIRD OF PARADISE.*

THE genus *Paradisæa* contains the famous Birds of Paradise, so noted during our early intercourse with Eastern countries. The bill is straight, compressed, rather strong, unnotched, the nostrils surrounded by a close tissue of feathers of a velvet texture, sometimes resplendent with metallic lustre. The birds are native to New Guinea and the neighbouring islands, and in consequence of the delicately graceful structure of their plumage, and the pure and beautifully blended colours by which they are adorned.

THE RICE BIRD.

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* Paradisæa major.

the species in general may be regarded as the most highly prized of all the feathered race. Their history was long obscure as night, and even now we have but few features of their character developed by the actual observation of trustworthy witnesses.

In the second edition of Pennant's "Indian Zoology," there is a general description of the genus from Valentyn and other writers, by Dr. J. R. Forster, preceded by a learned disquisition on the fabulous phœnix of antiquity, a bird of the size of an eagle, decorated with gold and purple plumes, and more particularly described by Pliny as being characterised by the splendour of gold around the neck, with the rest of the body purple, the tail blue, varied with rose colour, the face adorned with combs or wattles, and the head furnished with a crest. This excellently adorned phœnix Dr. Forster very properly supposes to have been no other than a symbolical Egyptian illustration of the annual revolution of the sun, and the conversion of the great year, which, according to Manilius, corresponds with the supposed life of the phœnix, and from which period the same course of seasons and position of the heavenly bodies is renewed. Now, though it is certain, as Dr. Forster observes, that the bird of paradise was never known to ancient writers, and that whatever the Egyptian priests delivered concerning their fabulous phœnix has no apparent agreement with the birds in question, yet it is remarkable enough that the names applied to them, both by Indian and European nations, attributes something of a supposed celestial origin. Dr. Shaw, however, thinks that this notion has, in all probability, arisen merely from their transcendent beauty, and the singular and delicate disposition of their plumage. The Portuguese who navigated to the Indian islands called them *Passaros da Sol*, in like manner as the Egyptians regarded their imaginary bird as symbolising the annual revolution of that great luminary. The inhabitants of the island of Ternate call them *Manuco Dewata*, or the birds of God.

The birds of paradise have great diversity of beauty. Some of them have thinly-barbed feathers to cover the closed wing, so prolonged as to form immense tufts, and extending far backward beyond the body. There are, also, in general, barbless filaments attached, which are even more elongated than the airy lateral plumes. Some, also, have thinly-webbed feathers on the flanks, but they are short; while another class have neither elongated filaments nor lateral tufts.

The most fanciful conjectures have been entertained in reference to the habits of these birds. By some they have been regarded as inhabitants of the air, living only on the dew of heaven, and never touching the surface of this terrestrial sphere; and others, while believing they never rested on the ground, have considered that they subsisted on insects. Some have ranked them among the birds of prey, and others—including Buffon—asserted that they had no feet, and could neither walk nor swim, and were incapable of any other means of progression except by flight.

Some little mystery beclouded the views of many, in consequence of the fact that the people of the islands from whence the bird of paradise was first obtained have paid little regard to the study of natural history. The fact is, that its legs being large and strong, and neither ornamental nor required in the skins made up for general commerce, were cut off; while the natives, thus concealing what they regarded as a deformity, considered themselves entitled to augment their demands when they offered the bird for sale. The purchaser of it in Europe naturally inquired for the legs of which it was destitute, and the seller began to think that it could have none. Having arrived at this satisfactory conclusion, it was a necessary inference that a bird without legs must live in the air, which would render them unnecessary; the extraordinary beauty of the plumage added to the deception, and as it was considered to have "heavenly beauty," it was thought also to have a "heavenly residence." In accordance with this view its name was given, and the false reports which have been propagated on the subject have thus arisen. Hence Linnæus and the older writers styled the bird *apoda*, or footless, although the man who introduced the bird to scientific observation in Europe distinctly stated that it was in no prominent respect different from other birds.

The true residence, or breeding-place, of these birds seems to be Papua, or New Guinea, from whence they make occasional excursions to some smaller neighbouring islands. They fly in flocks of about thirty or forty, led, it is alleged, by a single bird, which the natives call their king, but which is said to be of a different species. It is further pretended, that when this bird settles the whole flight settle also, in consequence of which they sometimes perish, being unable to rise again, owing to the peculiar structure of their wings. They also always fly against the wind, lest their plumage should be discomposed. While flying they make a noise like starlings, but their common cry rather resembles that of a raven, and is very audible in windy weather, when they dread the chance of being thrown upon the ground. In the Aru Islands they are seen to perch on lofty trees, and are variously captured by the inhabitants, with bird-lime snares and blunted arrows. Though many are taken alive, they are always killed immediately, embowelled, the feet cut off, the plumed skins fumigated with sulphur and then dried for sale. The Dutch ships frequenting the sea between New Guinea and Aru, a distance of about twenty miles, not unfrequently observe flocks of paradise birds crossing from one to the other of these places, but constantly against the wind. Should a gale arise, they ascend to a great

THE HONEY SUCKER.

height, into the regions of perpetual calm, and there pursue their journey. With respect to their food, we have little certain information from the older authors, some of whom assert they prey on small birds, a supposition which Dr. Shaw inclines to think is favoured by their strength of bills and legs, and the vigour with which they act in self-defence. They are said also to feed on fruits and berries; and Linnæus says they devour the larger butterflies.

A recent account of these birds in a state of nature is given by M. Lesson, who, though he deeply laments his short stay at New Guinea, only thirteen days, appears to have turned his visit to singular advantage.

"The birds of paradise," he says, "or at least the emerald (*Paradisæa apoda*, Linn.), the only species concerning which we possess authentic intelligence, live in troops in the vast forests of the Papuans, a group of islands situated under the equator, and which is composed of the islands Arou, Wagiou, and the great island called New Guinea. They are birds of passage, changing their quarters according to the monsoons. The females congregate in troops, assemble upon the tops of the highest trees in the forest, and all cry together to call the males. These last are always alone in the midst of some fifteen females, which compose their scraglio, after the manner of the gallinaceous birds." M. Lesson then gives the following extract from his journal written on the spot. After observing that the birds of paradise, with the exception of two species, were brought to the corvette, La Coquille, by the Papuans, and that the quantity afforded reason for supposing that these birds, so esteemed in Europe, were singularly multiplied in these countries, he thus continues:—"The manucode presented itself twice in our shooting excursions, and we killed the male and female. This species would seem to be monogamous, or perhaps it is only separated into pairs at the period of laying. In the woods, this bird has no brilliancy; its fine coloured plumage is not discovered, and the tints of the female are dull. It loves to take its station on the teak-trees (*arbres de teck*), whose ample foliage shelters it, and whose small fruit forms its nourishment. Its irides are brown, and the feet are a delicate azure. The Papuans call it 'saya.'

"Soon after our arrival at this land of promise (New Guinea) for the naturalist, I was on a shooting excursion. Scarcely had I walked some hundred paces in those ancient forests, the daughters of time, whose sombre depth was perhaps the most magnificent and stately sight that I had ever seen, when a bird of paradise struck my view: it flew gracefully and in undulations; the feathers of its sides formed an elegant and aërial plume, which, without exaggeration, bore no remote resemblance to a brilliant meteor. Surprised, astounded, enjoying an inexpressible gratification, I devoured this splendid bird with my eyes; but my emotion was so great that I forgot to shoot at it, and did not recollect that I had a gun in my hand till it was far away. One scarcely has a just idea of the paradise birds from the skins which the Papuans sell to the Malays, and which come to us in Europe. The people formerly hunted the birds to decorate the turbans of their chiefs. They call them *mambéfore* in their tongue, and kill them during the night by climbing the trees where they perch, and shooting them with arrows made for the purpose, and very short, which they make with the stem (*rachis*) of the leaves of a palm (*latanier*). The campongs, or villages of Mappia and of Emberbakêne are celebrated for the quantity of birds which they prepare, and all the art of the inhabitants is directed to taking off their feet, skinning, thrusting a little stick through the body, and drying it in the smoke. Some more adroit, at the solicitation of the Chinese merchants, dry them with the feet on. The price of a bird of paradise among the Papuans of the coast is a piastre at least. We killed during our stay at New Guinea a score of these birds, which I prepared for the most part. The emerald, when alive, is of the size of a common jay; its beak and its feet are bluish; the irides are of a brilliant yellow; its motions are lively and agile; and, in general, it never perches except upon the summit of the most lofty trees. When it descends, it is for the purpose of eating the fruits of the lesser trees, or when the sun in full power compels it to seek the shade. It has a fancy for certain trees, and makes the neighbourhood re-echo with its piercing voice. The cry became fatal, because it indicated to us the movements of the bird. We were on the watch for it, and it was thus that we came to kill these birds; for when a male bird of paradise has perched, and hears a rustling in the silence of the forest, he is silent, and does not move. His call is *roike, roike, roike, roiko*, strongly articulated. The cry of the female is the same, but she raises it much more feebly. The latter, deprived of the brilliant plumage of the male, is clad in sombre attire. We met with them, assembled in scores, on every tree, while the males, always solitary, appeared but rarely.

"It is at the rising and setting of the sun that the bird of paradise goes to seek its food. In the middle of the day it remains hidden under the ample foliage of the teak-tree, and comes not forth. He seems to dread the scorching rays of the sun, and to be unwilling to expose himself to the attacks of a rival. . . . .

"In order to shoot birds of paradise, travellers who visit New Guinea should remember that it is necessary to leave the ship early in tho morning, to arrive at the foot of a teak-tree or fig-tree, which these birds frequent for the sake of their fruit (our stay was from the 26th of July to the 9th of August) before half-past four, and to remain motionless till some of the males, urged by hunger, light upon the branches within range. It is indispensably requisite to have a gun which will carry very far with effect, and that the grains of shot should be large; for it is very difficult to kill an emerald outright, and if he be only wounded it is very seldom that he is not lost in thickets so dense that there is no finding the way without a compass.

THE GREAT EMERALD BIRD OF PARADISE.

"The little emerald paradise bird feeds, no doubt, on many substances in a state of liberty. I can affirm that it lives on the seeds of the teak-tree, and on a fruit called *amihou*, of a rosy-white, insipid, and mucilaginous, of the size of a small European fig, and which belongs to a tree of the genus *ficus*."

M. Lesson then goes on to state, that he saw two birds of paradise which had been kept in a cage for more than six months by the principal Chinese merchant at Amboyna. They were always in motion, and were fed with boiled rice, but they had a special fondness for cockroaches (*blattæ*).

Bennett, in his "Wanderings," gives the following account of a bird of paradise* which he found in Mr. Beale's aviary at Macao, where it had been confined nine years, exhibiting no appearance of age :—

"This elegant creature has a light, playful, and graceful manner, with an arch and impudent look; dances about when a visitor approaches the cage, and seems delighted at being made an object of admiration ; its notes are very peculiar, resembling the cawing of the raven, but its tones are by far more varied. During four months of the year, from May to August, it moults. It washes itself regularly twice daily, and, after having performed its ablutions, throws its delicate feathers up nearly over the head, the quills of which feathers have a peculiar structure, so as to enable the bird to effect this object. Its food during confinement is boiled rice mixed up with soft egg, together with plantains, and living insects of the grasshopper tribe ; these insects when thrown to him the bird contrives to catch in his beak with great celerity ; it will eat insects in a living state, but will not touch them when dead.

"I observed the bird, previously to eating a grasshopper given him in an entire and unmutilated state, place the insect upon the perch, keep it firmly fixed with the claws, and, divesting it of the legs, wings, &c., devour it, with the head always placed first. The servant who attends upon him to clean the cage gives him food, &c., strips off the legs, wings, &c., of the insects when alive, giving them to the bird as fast as he can devour them. It rarely alights upon the ground, and so proud is the creature of its elegant dress, that it never permits a soil to remain upon it, and it may frequently be seen spreading out its wings and feathers, and regarding its splendid self in every direction, to observe whether the whole of its plumage is in an unsullied condition. It does not suffer from the cold weather during the winter season at Macao, though exposing the elegant bird to the bleak northerly winds is always very particularly avoided. Mr. Beale is very desirous of procuring a living female, if possible, to breed them in his aviary.

"The sounds uttered by this bird are very peculiar ; that which appears to be a note of congratulation resembles somewhat the cawing of the raven, but changes to a varied scale of musical gradations, as, *he*, *hi*, *ho*, *haw*, repeated rapidly and frequently, as lively and playfully he hops round and along his perch, descending to the second perch to be admired, and congratulate the stranger who has made a visit to inspect him ; he frequently raises his voice, sending forth notes of such power as to be heard at a long distance, and as it could scarcely be supposed so delicate a bird could utter ; these notes are, *whock*, *whock*, *whock*, *whock*, uttered in a barking tone, the last being uttered in a low tone as a conclusion.

"A drawing of the bird, of the natural size, was made by a Chinese artist. The bird advanced steadily towards the picture, uttering at the same time its cawing, congratulatory notes ; it did not appear excited by rage, but pecked gently at the representation, jumping about the perch, knocking its mandibles together with a clattering noise, and cleaning them against the perch, as if welcoming the arrival of a companion. After the trial of the picture, a looking-glass was brought, to see what effect it would produce upon the bird, and the effect was nearly the same ; he regarded the reflection of himself most steadfastly in the mirror, never quitting it during the time it remained before him. When the glass was removed from the lower to the upper perch, he instantly followed, but would not descend upon the floor of the cage when placed so low.

"One of the best opportunities of seeing this splendid bird in all the beauty of action, as well as display of plumage, is early in the morning, when he makes his toilet ; the beautiful sub-alar plumage is then thrown out, and cleaned from any spot that may sully its purity by being passed gently through the bill ; the short chocolate-coloured wings are extended to the utmost, and he keeps them in a steady flapping motion, as if in imitation of their use in flight, at the same time raising up the delicate long feathers over the back, which are spread in a chaste and elegant manner, floating like films in the ambient air.

"I never yet beheld a soil on its feathers. After expanding its wings, it would bring them together so as to conceal the head, then bending it gracefully, it would inspect the state of its plumage underneath. This action it repeats in quick succession, uttering at the time its croaking notes ; it then pecks and cleans its plumage in every part within reach, and throwing out the elegant and delicate tuft of feathers underneath the wings, seemingly with much care, and with not a little pride, they are cleaned in succession, if required, by throwing them abroad, elevating them, and passing them in succession through the bill. Then turning its back to the spectator, the actions above-mentioned are repeated, but not in so careful a manner; elevating its tail and long shaft-feathers, it raises the delicate plumage of a similar character to the sub-alar, forming a beautiful dorsal crest, and throwing its feathers up with much grace, appears as proud as a lady dressed in her full ball-dress. Having completed the toilet, he utters the usual cawing notes, at the same time looking archly at the spectators, as if ready to receive all the admiration that it considers its elegant form and display of plumage demand; it then takes exercise by hopping, in a rapid but graceful manner, from one end of the upper perch to the other, and descends suddenly upon the second perch close to the bars of the cage, looking out for the grasshoppers which it is accustomed to receive at this time.

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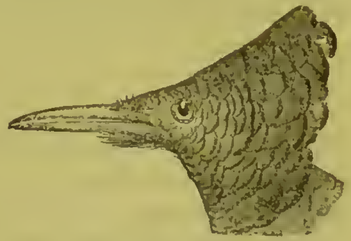
* Paradisæa apoda.

HEAD OF PARADISÆA REGIA.



HEAD OF ASTRAPIA GULARIS.*

"His prehensile power in the feet is very strong, and still retaining his hold, the bird will turn himself round upon the perch. He delights to be sheltered from the glare of the sun, as that luminary is a great source of annoyance to him if permitted to dart its fervent rays directly upon the cage. The iris frequently, by expanding and contracting, adds to the arch look of this animated bird, as he throws the head on one side to glance at visitors, uttering the cawing notes or barking aloud. . . . . . Having concluded, he jumps down to the lower perch in search of donations of living grasshoppers.

HEAD OF PARADISÆA VIRIDIS.

HEAD OF EPIMACHUS REGIUS.†

"This bird is not at all ravenous in its habits of feeding, but it eats rice leisurely, almost grain by grain. Should any of the insects thrown into his cage fall upon the floor, he will not descend to them, appearing to be fearful that in so doing he should soil his delicate plumage; he therefore seldom or ever descends, except to perform his ablutions in the pan of water placed at the bottom of the cage expressly for his use."

THE GREATER BIRD OF PARADISE.‡

This is an exceedingly graceful bird. The long plumes with which it is ornamented prevents its flying except against the wind; for this, if blowing in the course of the bird, would not only disorder these feathers, but, acting on them like sails, they would drive the bird along with irresistible rapidity. These birds abstain altogether from flight during a storm, which would inevitably hurl them to the ground. When on the wing they are noisy, like starlings; but their common cry is said rather to resemble the croaking of ravens, and is particularly audible when, in somewhat windy weather, the incumbrance of their long feathers brings them into imminent danger of falling.

In the Aru Islands they are said to perch on the highest trees, and are taken by the inhabitants with bird-lime or blunt arrows. When taken alive, they defend themselves with their bills, pecking and biting with great resolution. In size this bird is larger than a thrush. The general colour is a deep cinnamon, with the exception of the top of the head and the back of the neck, which are yellow; the feathers which encircle the base of the beak as far as the eyes, and cover the whole of the throat, are like velvet, and of a deep emerald-green. In the male, there springs from each side of the chest a full plume, from sixteen to eighteen inches long, composed of slender shafts, with fine, loose, delicate webs; in some specimens they are bright yellow at the base, fading gradually into straw-colour; in others they are paler. From the tail-coverts spring two slender, naked shafts of great length, which taper gradually to a point, and are of a deep cinnamon-brown. These elegant appendages are said to be lost during four months of the year. In all probability, as in the instance of the whidah-birds and others, these feathers are the decorations of the breeding season—the period in which all birds put on their gayest and most brilliant attire.

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* Vieillot.

† Lesson.

‡ Paradisæa major.

THE MAGNIFICENT BIRD OF PARADISE.*

THIS is a richly-coloured species; it is of an orange-chestnut colour above, the top of the head and the back being deeper than the rest. The former, in some species, inclines to purple; the tips of the wings and tail are brown; the throat is blackish, with a purple gloss. The breast and under parts are covered with scale-shaped feathers, of a deep, changeable, golden-green colour, having down the breast a blue reflection. A double ruff, composed of slender plumes, with slightly-detached extremities, springs from the back of the neck.

The first series are short and orange-coloured, with a black spot at the end of each; the others are larger and pale yellow. The wing-coverts are orange-coloured, with transverse blackish crescents. From the tail-coverts spring two long, slender shafts of golden-green. In size this bird is somewhat inferior to the greater bird of Paradise.

THE KING BIRD OF PARADISE.†

THIS is one of the smallest and rarest of this delightful group. It is about the size of a sparrow. Above, it is of an intense purplish-chestnut, and beneath it is white. A zone of golden-green extends across the chest; from the sides spring two fan-like plumes, consisting of six or seven dusky feathers, with the richest golden green. From the tail-coverts spring two long, slender shafts, each elegantly terminating in a broad emerald web, rising from one side only of the shaft, and disposed into a flat spiral curl. The beak and legs are yellowish-brown.

We give, in addition to the birds now described, representations of the heads of a few others which, with the whole of the species, will reward all the attention they receive.

THE HORNBILLS.‡

ANOTHER family comprises the *Buceridæ*, or the Hornbills, birds of extraordinary appearance, confined to India and Africa. The species are characterised by their enormous bills, toothed along their edges, and frequently surmounted by an additional horny structure, which bestows on them a very striking and peculiar physiognomy. These excrescences vary considerably with the age of the individual, and are scarcely perceptible in the very young birds. The hornbills may be said to resemble the toucans in their heads, the crows in their general habits, and other of the feathered tribes in the form of their feet. Their tongue is very small. These birds may be regarded as omnivorous, as they feed indifferently on fruits, mice, small birds, reptiles, and even carcases. They exhibit an awkward and uncommon aspect while in the act of flying, in consequence of the great size of their beaks and lengthened tails; and altogether their appearance is extremely uncouth. Perhaps one of the most singular features in their economy consists in their feeding greedily, and without injury, on the seeds of *nux vomica*.

The large bills of these birds are not solid, but of a cancellated internal structure. As the process or appendage to this instrument does not exhibit its genuine form till the full growth of the bird, and the difference between the males and females is very considerable, the determination of the species has been attended with no small degree of difficulty. Buffon has not failed to descant on the mal-conformation of the bill, and on its liability to bruises and fractures; but he was not aware of the fact that these injuries are annually repaired by an inherent reproductive power, so that even the missing serratures are replaced at every moulting. These birds walk little and awkwardly, and generally perch on trees, especially such as are dead, in the hollows of which they breed.

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* Paradisæa magnifica.

† Paradisæa regia.

‡ Buceridæ.

THE RHINOCEROS HORNBILL.*

THIS bird is black; the tail is tipped with white; the beak yellowish and recurved, the casque is red above; the general size is that of a hen turkey, but more slender in proportion; the extent of wing is nearly four feet; the neck is of moderate length; and the tail is slightly cuneated. The plumage is black, but exhibiting, when exposed to a strong light, a slight bluish gloss; but the lower part of the abdomen and the tail are white. The bill measures about ten inches in length, and is of a slightly curved form, sharp pointed, serrated in a somewhat irregular manner on the edges, and furnished at the base of the upper mandible with an extremely large process, continued for a considerable space in a parallel direction with the bill, and then turned upwards in a contrary direction, in the style of a reverted horn. This appendage, which is eight inches long and four in width at the base, is divided into two portions by a longitudinal black line. Though apparently a formidable weapon, this singular bill is by no means so in reality; for Le Vaillant assures us, that he often put his hand into it without feeling the slightest pain, though the bird exerted all its endeavours to wound him. The young is destitute of the horn-like excrescence on the bill.

This species occurs in the Philippine islands, in Java, Sumatra, and various countries of India. The individuals belonging to it have a melancholy, wild air, a heavy gait, hop instead of walking, and are of a timid and stupid disposition. In a wild state they live on flesh and carrion, and are known to accompany the hunters of bears, wild cows, and stags, to pick up the intestines, and other refuse of these animals, which are assigned to them. In Sumatra, when kept in confinement, they are fed on rice and soft meats; and in various parts of India they are domesticated for the purpose of catching rats and mice. When they have got one of the latter, they squeeze it in their bill to soften it, throw it up in the air, and then receive it entire into their capacious gullet. That described by Le Vaillant never manifested anything like sprightliness, but when its food was presented, it advanced with extended wings, and uttered a slight scream of joy. It was fed with biscuits steeped in water, flesh either raw or dressed, rice, &c. When presented with some newly-killed small birds, it readily swallowed them entire, after bruising them for some time in its bill.

THE UNICORN HORNBILL.†

THIS bird is slightly crested; the abdomen is black, and the sides of the tail-feathers white; the bill is yellowish, with compressed casque, black above, and pointed in front. The Unicorn Hornbill is about the size of a raven, and its outstretched wings measure nearly three feet. The female is rather smaller than the male, and has the casque less elevated, and its point less prominent.

These birds frequent high woods, perching on large trees, especially on the dead boughs. They nestle in the hollows of decayed trunks, and lay about four eggs, of a dirty white. The young are at first quite naked, and their bills have merely a slight ridge, three or four lines high, and which is not clearly defined till the space of three months, when they take their flight, and the point does not project till they are fully grown and have assumed their mature plumage. This part, it has been remarked, is subject to frequent accidents from striking against the branches of trees, when the bird is endeavouring to detach the bark, in order to obtain the insects, small lizards, and tree-frogs which lurk beneath. The individual described by Buffon hopped with both feet at once, forwards and sideways, like a magpie or jay. When at rest, its head seemed to recline on its shoulders; when molested, it swelled, and raised itself with an air of boldness, but its general gait was dull and heavy. It swallowed raw flesh, and would also eat lettuces, which it first bruised with its bill. It caught rats, and devoured a small bird that was thrown to it alive. Its ordinary voice was a short, hoarse croak: and it likewise uttered at intervals a sound exactly similar to the clucking of a hen. It was fond of warmth, spread its wings to the sun, and shivered at a passing cloud or gale. It lived only three months, dying before the end of the summer.

THE CRESCENT HORNBILL.‡

THIS hornbill is black; the tip of the tail is white; the bill is yellowish, and the casque is lunated upwards. It is about the size of the preceding bird, which it considerably resembles; but the casque of the bill is shaped like a crescent or boat, longitudinally affixed by its bottom to the ridge of the upper mandible. It is not concave at the top, but flattened, and the two ends rise up, the one before the other, behind the base of the mandible; that in front somewhat exceeding the length of the other. It is a native of Java, where it is said to frequent large woods, uniting in troops, in order to devour carrion. The female wants the patch of red-brown between the shoulders which characterises the male, and is besides somewhat smaller than the latter.

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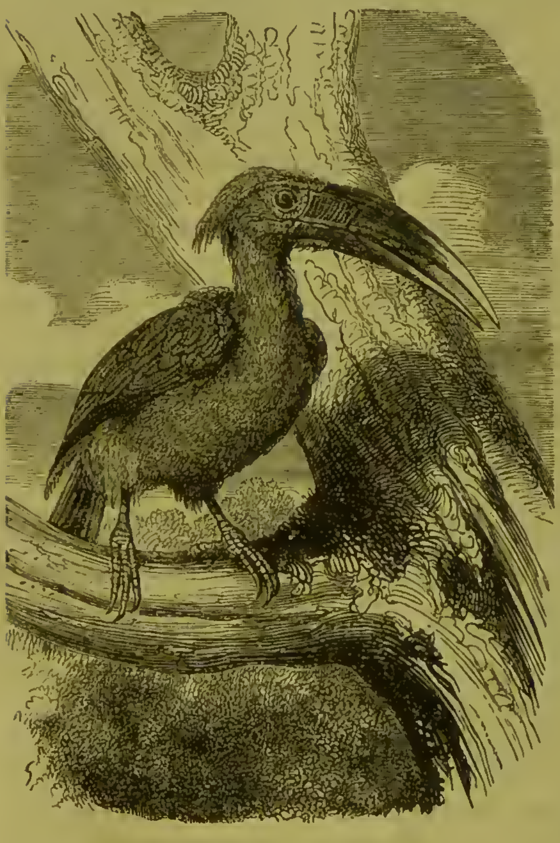
* Buceros rhinoceros: Linnæus.

† Buceros monoceros: Shaw.—Buceros Malabaricus: Latham.

‡ Buceros Niger: Vieillot.

THE CONCAVE HORNBILL.*

This is a most remarkable bird, the largest of the species. The beak, from the eye to the tip, measures one foot; the distance from the eye to the end of the tail is three feet four inches. Of this we give, in a large engraving, a very striking and accurate representation. Active and alert, notwithstanding the magnitude of its beak, this bird lightly traverses the trees of the forest, which resounds with its roar. The body is muscular and vigorous; the tail is large; the wings rounded; the colour is black and white; the feathers about the cheeks and back of the neck are loose and hair-like; and the bill is yellowish, with a tinge of scarlet.



THE CROWNED HORNBILL.

The African hornbill (*Buceros Africanus*) is entirely black, and nearly as large as a turkey. The crowned species (*Buceros coronatus*) is a much smaller bird, scarcely equalling the size of a magpie. Le Vaillant saw a flock of more than five hundred of these birds, in company with crows and vultures, preying on the remains of slaughtered elephants. It is here accurately represented. A large and remarkable Indian species has been of late years described by Mr. Hodgson. It measures four feet five inches from tip to tip of the wings, and is three feet six inches in length. Its body exceeds that of the largest raven, but is very lean and incompact. It is believed to feed chiefly on fruits, although it will seize upon reptiles when pressed by hunger. Its freedom from any offensive smell, and the excellence of its flesh, which is much esteemed as an article of food, go far to prove that its habits are chiefly frugivorous. In a domestic state it will eat meat either raw or dressed. Mr. Hodgson's specimen, however, was fed mostly on boiled rice mixed with ghee, and made into large balls. It was never observed to take any water. Whenever it swallowed a mouthful which, on second thoughts, it considered as somewhat too large, it immediately disgorged it for the sake of a little additional mastication.

THE VIOLACEOUS HORNBILL.†

This bird is of a violaceous black; the sides of the wing and tail-feathers are white; the bill is whitish; the casque is compressed, obtuse in front, and marked by a black spot. It nearly resembles the unicorn species, but is of a smaller size. When viewed in a full light, it is very richly glossed with violet, green, and purple reflections; though, when viewed in the shade, it appears of a greenish-black. It is a native of Ceylon. Le Vaillant mentions that he saw one which had been brought to the Cape of Good Hope. It showed much attachment and docility to its keeper, was fed with meat, either raw or dressed, and with various kinds of vegetables. It pursued, and readily caught, both rats and mice, which it swallowed entire, after having rubbed them in its bill. Whenever a quarrel arose among other birds, it immediately ran to them, and, by the strokes of its bill, enforced a suspension of hostilities. It even kept the larger birds in awe, and would make an ostrich take to its heels, pursuing it half flying and half running. It imposed, in short, on the whole menagerie, more, we may presume, by the size of its enormous bill than by any intrinsic strength or courage.

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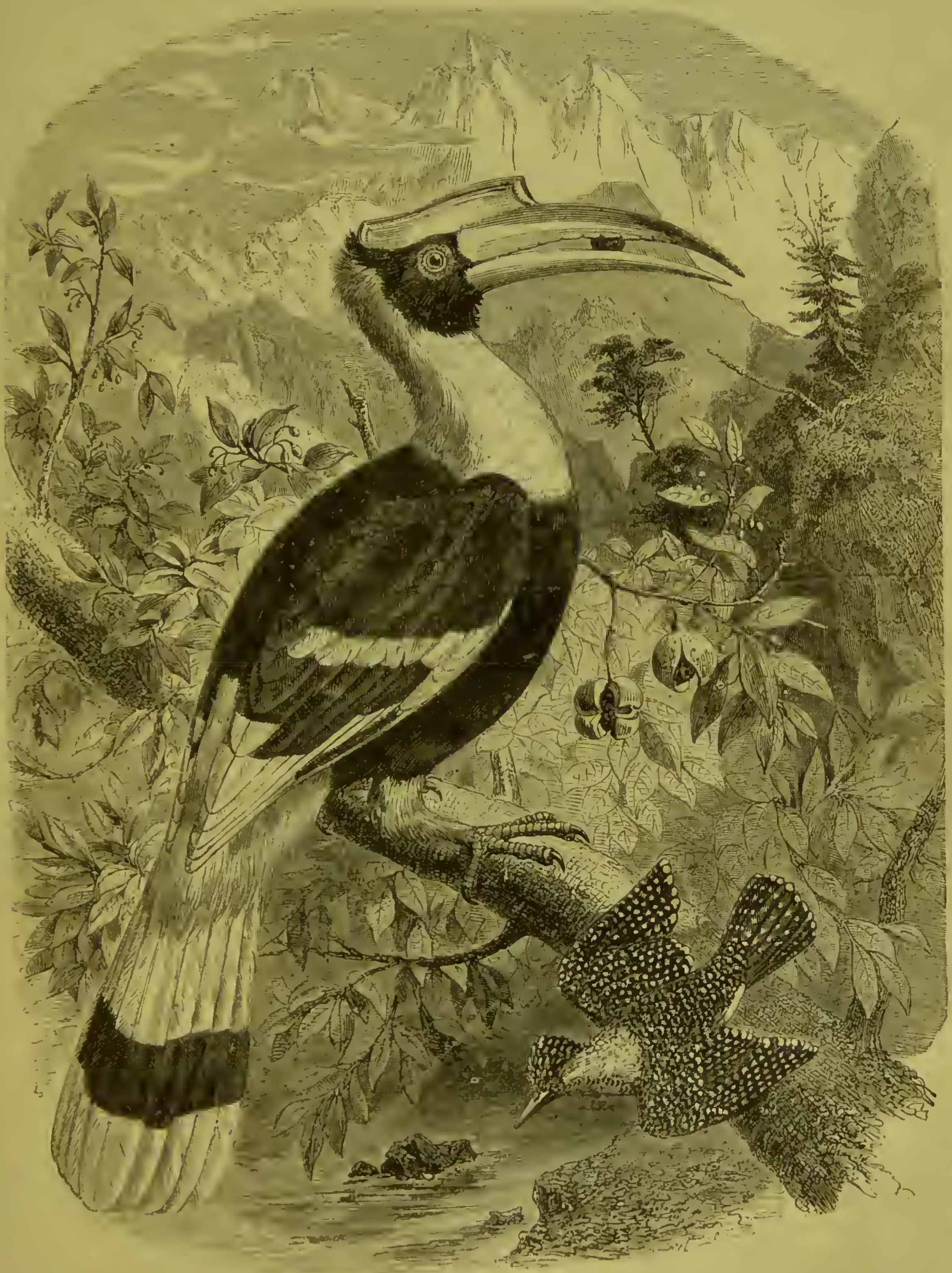
* Buceros cavatus.

† Buceros violaceus: Le Vaillant.



THE CONCAVE HORNBILL.

THE ABYSSINIAN HORNBILL.*

This bird is black, with white primary quills, the secondaries ferruginous; the bill is black, and casque abruptly orbicular. According to Mr. Bruce, who has distinctly described this species, it is of a blackish fuliginous hue, measuring three feet ten inches in length, and six feet in extent of wing. On the neck are several protuberances, as in the turkey, of a light blue, changing on various occasions to red. It is found in Abyssinia, generally among the fields of taff, feeding on the green beetles that frequent that plant. As it has a fœtid smell, it has been erroneously supposed to subsist on carrion. It usually runs on the ground, and does not hop like most of its congeners; but, when raised, it flies both strong and far. It is supposed to be very prolific, as it has been seen with eighteen young ones attending it. It builds in large, thick trees, making a curious nest like that of the magpie, but four times larger than that of the eagle, placed firm on the trunk, at no great distance from the ground, and with the entrance always on the east side. The young, according to Le Vaillant, are of a brownish-black colour, with the larger wing-feathers rufous-white; and such seems to have been the specimen described by Buffon.

Of the species which want the horn-like appendage, we shall notice only one.

THE RED-BILLED HORNBILL.†

Black and white, with a simple red bill and red legs. Size, not superior to that of a magpie; length rather more than twenty inches. Common in Senegal, where it is known by the name of *Tock*. When young it is very simple and unsuspicious, and will suffer itself to be approached and taken; but it gradually becomes shy as it advances in age. It frequents woods, the old birds perching on the summits of the trees, and soaring with rapid flight, while the young generally remain in the lower parts of the trees, sitting motionless, with the head contracted between the shoulders. In their native state they live on wild fruits, and in confinement on almost anything that is presented to them.

EURYCEROS PREVOSTII.

THE EURYCEROS PREVOSTII.‡

This bird is a species inhabiting Madagascar, and has been placed by Lesson in a separate family.

THE CREEPERS.§

The fourth tribe, *Tenuirostres*, embraces several groups of beautiful and interesting birds, the greater part of which are peculiar to the warmer regions of the globe. They are all distinguished by long slender bills, and hence their name. They are adapted to those parts of the earth where flowers appear in constant succession; from these they obtain their nectar, and an endless supply of the smaller insects designed for their subsistence. We shall, therefore, proceed to trace the outline of the principal families of the tenuirostral birds, and point out their character by some of the most prominent and interesting examples.

The old genus, *Certhia* of Linnæus, was characterised by an arched bill, yet the species possessed but little else in common, and have been therefore formed into several minor groups. The true or restricted creepers (*Certhia*: Cuvier), so called from their habit of running round the trunks of trees, have the bill of medium length, curved, compressed, slender, sharp pointed. The tail is wedge-shaped and composed of stiff deflected feathers. Our well-known British species (*Certhia familiaris*) is the only example of the genus found in Europe, and it is, in fact, doubtful whether there is any other elsewhere. The North American creeper seems identical, but the numerous other birds described as creepers do not belong to the genus *Certhia*. The solitary type is a retired inhabitant of the woods, in no way conspicuous in colour, though pleasingly mottled above with black, brown, and grayish-white; and being of small size, and seldom showing itself in open places, is deemed rarer than it really is.

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* Buceros Abyssinicus: Latham. † Buceros nasatus: Linnæus, &c. ‡ Lesson. § Certhiadæ.

In the greater number the tail is equal. Of these we may name the superb creeper (*Certhia superba*), described and figured in the magnificent work of M. Vieillot. Its length is six inches; the crown of the head, upper part of the neck, smaller wing-coverts, back, and rump, are bright greenish-gold; across the upper part of the breast runs a bar of bright gilded-yellow, beneath which the whole under parts are deep brownish-crimson; the wings and tail are blackish-brown; the legs are also brown; the bill is black. This beautiful species was discovered at Malimba, in Africa, by M. Perrein. Another highly adorned species, such as limners love to paint, and ladies to look upon, is the *Certhia splendida* of Shaw (*Certhia afra* and *lotenia*: Linnæus). It usually occurs in woody places, and, in addition to its splendid plumage, is said to be worthy of admiration for its musical powers—its song being by some esteemed equal to that of the nightingale. The spotted-breasted cinnyris (*Certhia maculata*) also dwells in the forests of Malimba, and frequently approaches the habitations of the natives, allured by the flowers of the *cytisus cajan*, commonly called the congo pea, which, according to Dr. Shaw, is much cultured by the negroes.

THE COMMON CREEPER.

In some of these birds the central feathers of the tail are lengthened in the males. Such is *Certhia violacea*, a Cape species, which likewise dwells in woods, and is said to build a nest of a singularly-elegant construction. In a few the bill is almost straight, as in *Certhia rectirostris*, Vieillot. Our restricted limits will not admit of our expatiating on this delightful group.

THE COMMON CREEPER.*

The Common Creeper, though of a somewhat lengthened form, is probably, with the exception of the yellow-crested wren, the smallest-bodied British bird. It is said to feed entirely upon insects, although, as a winter resident in many frost-bound regions, we cannot aver that it never swallows seeds. It builds in the hollows of trees, and may be often seen during the delightful autumn, when the rustling woods are fragrant with fallen leaves, flitting from the top of one trunk to the bottom of another, which it ascends by a kind of spiral progression, and then darting downwards to a neighbouring tree, it thus busily pursues from time to time its uninterrupted flight. This bird chiefly shows itself in our shrubberies and wooded pleasure-grounds in winter.

It inhabits not only Britain, but the Continent of Europe. It is said to migrate to Italy in September and October. It has been particularly noticed in various parts of Germany, and is described as inhabiting North America. Prince Musignano states that it is common and permanent near Rome and rare near Philadelphia.

The creeper is a most active and restless little bird, ever on the alert, intent on picking up its food, which it finds on the trunks and branches of trees. A constant resident in Britain, it is not easily seen there, for its activity in shifting its position makes it very difficult to follow with the eye. One instant it is before the spectator, and the next, from the rapidity of its passage, the intervening branch or trunk hides the bird from his view. The form of its tail, and the structure of its feet, are exquisitely adapted to its rapid locomotion. Its oft-repeated note is monotonous.

This bird provides a nest in the hole or behind the bark of decayed trees, formed of dry grass, and the inner part of the bark is lined with small feathers. Here six or eight eggs are deposited. While the female sits on these she is regularly fed by the male bird.

THE WALL-CREEPER.†

HEAD OF THE WALL-CREEPER.

The habitat of this bird is the south of Europe. It is tolerably abundant in Spain and Italy, always, however, on the most elevated rocks, and very rare on mountains of moderate height. According to Temminck, it is never found in the north. This bird is common in Provence, and may be seen creeping on the outer walls of St. Peter's at Rome.

This bird does against the vertical faces of rocks what the common creeper does on trees. To these surfaces it adheres firmly, without, however, mounting or descending by creeping. Clefts and crevices of rocks are its favourite haunts, and sometimes, but very rarely, the trunks of trees. It feeds on insects, their caterpillars and chrysalises, and is particularly fond of spiders and their eggs.

The Wall-creepers moult twice in the year. In the spring only the throat of the bird is attired in black; this ornament disappears before the other feathers fall. It is impossible to distinguish the sexes after pairing and breeding-time. The young may be distinguished from their parents before their first moult, but in winter no difference is observable.

THE BAKER.‡

This bird inhabits the Malouine islands. It lives on the beach, where its familiarity and fearless disposition permits approach till it may almost be touched with the hand. A naturalist, who sojurned in these islands, remarks :—"This bird is so tame that it will almost fly upon the finger; in less than half an hour I killed ten with a small switch, and almost without changing my position. It scratches in the goëmons (*fucus*) which the sea throws on the beach, and there eats worms and small shrimps, which they call sea-fleas (*puces de mer*). Its flight is short. When disturbed, it contents itself with flying two or three paces further off. Its habits are solitary."

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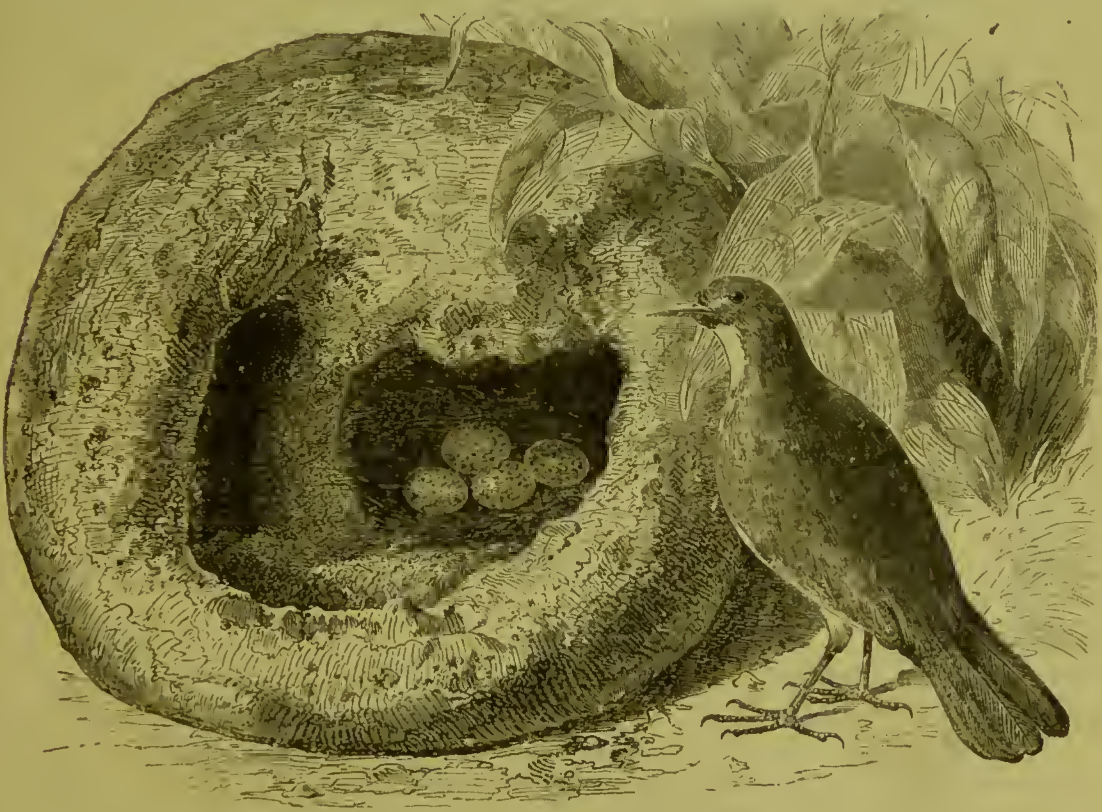
* Certhia familiaris.

† Certhia muraria: Linnæus.

‡ Fulnarius fugilinosus.

The entire plumage of the bird is a clear fuliginous brown. The neck above exhibits yellow and brown ill-defined striæ. The under side of the tail is a bright gray-brown. It constructs its nest in the form of an oven.

This bird may properly be classed among the masons, of which there are many in Britain and America. The blackbird, the wood-robin of America, the pewit fly-catcher, and some others, employ a portion of masonry, either on the outside or in the middle of their nests; but the material used being chiefly mud or clay, the structure is rude and unfinished. But the *Fulnarius*, called "the Baker," from its oven-like structure, is a mason of no ordinary skill. Its nest is composed of earth, and though it is of considerable size, it is often completed in two days' labour—the male and female engaging equally in the task, each carrying alternately a ball of mortar about the size of a filbert. It is six inches and a half in diameter, and an inch thick. The opening, which is lateral, is twice as high as it is wide; and the interior is divided into two chambers, by a partition beginning at the entrance, and carried circularly backwards.



THE BAKER.

THE SUN-BIRDS.*

Of this race of the feathered tribes it has been truly said:—

> "Each spangled back bright sprinkled specks adorn,
> Each plume imbibes the rosy tinctured morn;
> Spread on each wing the florid season's glow,
> Shaded and verged with the celestial bow;
> Where colours blend an ever-varying dye,
> And wanton in their gay exchanges vie."

Hence it is that they are called "Sun-birds," appearing, as they do, in extraordinary resplendence among their generally dull-plumaged companions. It was, indeed, to be expected that some portions of the Old World, and more particularly those under the tropics, would present forms bearing a close alliance in their habits, and exhibiting some of the resplendent colouring which so conspicuously mark the plumage of the humming-birds. And these expectations, commenced by theory as a general law, have been verified in this instance by facts, for the continents of Asia and Africa are the strongholds of this race of fairy birds, which vie with the *Trochilidæ* in brilliancy ; and though they differ in many of the essential parts of their structure, they still agree by holding the same place in the ornithological economy of the countries they inhabit.

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* Soui-mangas. Cinnyris: Cuvier. Cinnyridæ. Nectariniadæ.

The sun-birds are peculiarly restricted to the tropics of Asia and Africa ; but when we take the form as a family, we shall find it extending far beyond that range, and reaching, on the one hand, to the numerous islands in the Pacific Ocean, while, in another direction, a few members occur in South America and the adjacent islands, in both instances forming the exception in the amount of numbers ; the form in the first being the one peculiarly taken up by the *Meliphagidæ*, or honey-suckers ; in the latter, by numerous and abundant species of humming-birds.

The humming-birds, although they want the wide gape and other accessories around the mouth provisional for capturing insects in flight, in form most closely resemble the fissirostral genera, being deficient in the members particularly adapted for perching, while they possess an extraordinary development of those proper for flight. The want of adaptation, however, in other members prevents the wings being used to pursue an insect prey, though their great development is as necessary to the manner in which they feed, by hovering above the beautiful blossoms which afford a sustenance in part alike to them and to a host of minute insects, and also to perform the lengthened migrations which these species are known to undertake annually. In the sun-birds, or *Nectariniadæ*, we see no such extraordinary development of wing, and their legs and feet, or, in other words, their provisions for perching, are equal to those of the majority of the *Insessores*, and show at once a marked difference between the structure of the same parts in truly fissirostral birds, where they are always extremely weak, comparatively unfitted for perching or settling on the ground, and where, in fact, they are constructed upon that model which will be least incommodious to the bird in pursuing its prey with rapidity through the air, or in performing very long migrations. The nectariferous juices of flowers have also been considered as the chief food of the sun-birds, at least during certain seasons of the year ; but we find the manner of seeking for these to be very different from the hovering flight of the humming-birds : the *Nectariniadæ* always perching first, and exhibiting more similarity, in passing from blossom to blossom, to the activity of some of our small warblers, rapidly examining the flowers of one plant, and immediately passing off to another, uttering, during the while, a shrill and impatient call. Neither do the species perform extensive migrations, at least where a continued flight has to be maintained. In the Old World the change of station is chiefly from the town and coast districts to the more exalted regions where it is possible a succession of food may be acquired ; or, if the range is more extensive, it is performed over tracts, or coastwise, where resting-places may be found during its continuance. In both groups the bill and the tongue are inserted into the tubes, and withdraw from them the honey and the small insects which are attracted by it. In both the mechanism of the tongue is in different manners adapted for this mode of deriving nourishment, and in both are the members of the family extremely numerous, social in their habits, and probably intended in their respective countries as one of the means for the fructification of plants.

In their nidification, the sun-birds present some difference from the humming-birds, though we, perhaps, know less about the nests and the places where their fabric is reared ; the exquisite structure and curious small size of those of the latter being objects of request or curiosity even to many who do not generally take an interest in such productions. Many of the sun-birds breed in the clefts and hollows of worm-eaten trunks of trees, where no nest possessing external interest is found ;* others place the nest among thick bushes, and form it of the down of plants, covering it externally with lichens or fine mosses.† Of the nest of an Indian species Dr. Latham thus writes, upon the authority of General Hardwicke :—"The nest, composed of fine downy materials, mixed with a few dead leaves, is in shape nearly globular, about three inches in diameter, and at bottom runs to a point at least four inches beyond it ; the entrance at the top, and on one side, next to the branch to which it is attached, has a kind of head or cover over the entrance." In most cases where we have any notice of them, the eggs are described as of a pale colour, bluish-gray, or reddish, with brown or greenish spots ; in the humming-

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* Vaillant, Sucrier eblanisant : S. Velour.

† S. Oranga : Vaillant.

HUMMING-BIRDS.

birds they are generally white. The nest of the *Nectarinia Goalparensis* is represented by Professor Royle as suspended, and having the hole or entrance near the upper part, the materials of which it is constructed being rather coarse. From these descriptions, the character of the nests of the Indian species partakes more of those of the Arthotomi and tailor-warblers. Mr. Jerdon writes of the *Cinnyride Mahrattensis* :—"I have seen the nest of this pretty little bird close to a house at Jaulnah. It was commenced on a thick spider's web, by attaching to it various fragments of paper, cloth, straw, grass, and other substances, till it had secured a firm hold of the twigs to which the web adhered, and the nest suspended on this was then completed by adding other fragments of the same materials ; the hole is at the one side, near the top, and has a slight projecting roof or awning over it."

THE SPLENDID SUN-BIRD.*

THIS is a large species, and certainly when the male is seen in his full breeding-dress, one of the most gorgeously-dressed of the whole tribe. Le Vaillant found this bird in the country of the Great Namaqua, near the Fish River, but only during the season of incubation ; so that it is probable that a more western locality may be its true and continuous habitation. It is introduced by Mr. Swainson in his "Birds of Western Africa," and specimens have been received, by the attention of Dr. W. Fergusson, from the vicinity of Sierra Leone. In the country of the Namaquas the nest was placed in the worm-eaten trunks of mimosa trees, and contained from four to five entirely white eggs.

THE SPLENDID SUN-BIRD.

The total length of the adult male, measured from Sierra Leone specimens, is from five inches and a half to five and three-quarters, being nearly an inch longer than the measurement given by Mr. Swainson. The back of the neck, back, shoulders, and upper and under tail-coverts, are brilliant golden-green, varying with every change of light ; the head and throat are steel-blue, in some lights appearing as black, in others as rich violet ; across the breast there appears in most lights a band of scarlet, but in some positions it appears as if banded with steel-blue, golden-green, or violet, and at times to be almost entirely composed of one of these tints ; this is occasioned by the structure of the feathers ; near the base the colour is of the metallic tints alluded to, but the tips of the plumules are lengthened into fine vermilion tips without barbs, which are so slender as sometimes to be entirely lost when seen against the dark tint of the feather lying beneath. On the sides of this beautiful bird spring two auxiliary tufts of pale lemon colour. The breast, belly, and flanks, wings and tail, are deep black, the latter edged with golden-green. In this species also the tail-coverts are of an unusual form, very nearly as long as the feathers of the tail, the webs very ample, loose, and unconnected. The legs, feet, and bill are black. The female, according to Le Vaillant, is entirely of an "earthy brown," paler beneath, tinted with olive on the wings and tail, the last having the lateral feathers bordered exteriorly with dirty white; the bill and feet blackish brown. The young resemble the female.

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* Nectarinia splendida : Shaw.

HUMMING-BIRDS.

Another family,* the Humming-birds, have been fairly characterised as fairy-like, and may be truly designated "the jewels of ornithology." They are the

"Least of the winged vagrants of the sky."

How sweetly has Mary Howitt sung:—

"The humming-bird! the humming-bird!
So fairy-like and bright;
It lives among the sunny flowers,
A creature of delight!

"In the radiant islands of the East,
Where fragrant spices grow,
A thousand, thousand humming-birds
Are glancing to and fro.

"Like living fires they flit about,
Scarce larger than a bee,
Among the dusk palmetto leaves,
And through the fan-palm tree.

"And in the wild and verdant woods,
Where stately moras tower,
Where hangs from branching tree to tree
The scarlet passion flower.

"Where, on the mighty river banks,
La Plate or Amazon,
The cayman, like a forest tree,
Lies basking in the sun.

"There builds her nest the humming-bird
Within the ancient wood,
Her nest of silky cotton down,
And rears her tiny brood.

"She hangs it to a slender twig,
Where waves it light and free,
As the campanero † tolls his song,
And rocks the mighty tree.

"All crimson is her shining breast,
Like to the red, red rose;
Her wing the changeful green and blue
That the neck of the peacock shows.

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* Trochilidæ.

† In the extensive wilds of Demerara, at a distance of nearly three miles, you may hear this snow-white bird tolling every four or five minutes, like the distant convent bell. It is generally to be seen resting on the dried top of an aged mora tree.

"Thou happy, happy humming-bird,
No winter round thee lowers,
Thou never saw'st a leafless tree,
Nor land without sweet flowers!

"A reign of summer joyfulness
To thee for life is given;
Thy food, the honey in the flower,
Thy drink, the dew from heaven.

"How glad the heart of Eve would be,
In Eden's glorious bowers,
When she saw the first, first humming-bird
Among the spicy flowers;

"Among the rainbow butterflies,
Before the rainbow shone,
One moment glancing in her sight,
Another moment gone!

"Thou little shining creature,
God sav'd thee from the flood,
With eagle of the mountain land,
And tiger of the wood!

"Who cared to save the elephant,
He also cared for thee,
And gave those broad lands for thy home,
Where grows the cedar-tree!"

"Of all animated beings," says Buffon, "the humming-bird is the most elegant in form and most splendid in colouring. Precious stones and metals artificially polished, can never be compared to this jewel of Nature, which has placed it in the order of birds at the bottom of the scale of magnitude—*maximè miranda in minimis*—while all the gifts which are only shared among others—nimbleness, rapidity, sprightliness, grace, and rich decoration—have been profusely bestowed upon this little favourite. The emerald, the ruby, the topaz, sparkle in its plumage, which is never soiled by the dust of the ground, for its whole life being aerial, it rarely lights on the turf. It dwells in the air, and flitting from flower to flower, it seems to be itself a flower in freshness and splendour; it feeds on their nectar, and resides in climates where they glow in perpetual succession; for the few which migrate out of the tropics during the summer make but a transitory stay in the temperate zones. They follow the course of the sun, advancing or retiring with him, and flying on the wings of the zephyrs, wanton in eternal spring."

The humming-bird has indeed been universally beloved and admired by every lover of Nature. Audubon compares it to the glittering fragment of a rainbow; the American Indians give it a name signifying a sunbeam, expressive of its brilliancy and rapidity of motion, and frequently wear it in their ears as a pendant; and the enthusiastic Alexander Wilson, in his history of its habits, makes it the subject of a poem, from which we cannot refrain extracting a few lines:—

"When the morning dawns, and the blest sun again
Lifts his red glories from the eastern main,
Then through our woodbines, wet with glittering dews,
The flower-fed humming-bird his round pursues;
Sips, with inserted tube, the honey'd blooms,
And chirps his gratitude as round he roams;
While richest roses, though in crimson drest,
Shrink from the splendour of his gorgeous breast.
What heavenly tints in mingling radiance fly!
Each rapid movement gives a different dye;
Like scales of burnished gold they dazzling show,
Now sink to shade—now like a furnace glow."

No sooner, indeed, has the returning sun again introduced the vernal season, and caused millions of plants to expand their leaves and blossoms to his genial beams, than the little humming-bird is seen advancing on fairy wings, carefully visiting every opening flower-cup, and, like a curious florist, removing from each the injurious insects that would otherwise ere long cause their beautiful petals to droop and decay. Poised in the air, it is observed peeping cautiously and with sparkling eye into their innermost recesses, while the ethereal motion of its pinions, so rapid and so light, appear to fan and cool the flower without injuring its delicate texture, and produce a delightful murmuring sound well adapted for lulling the insects to repose. This, then, is the moment for the humming-bird to secure them. Its long delicate bill enters the cup of the flower, and the protruded double-tubed tongue, delicately sensible, and imbued with a glutinous saliva, touches each insect in succession, and draws it from its lurking-place, to be instantly swallowed. All this is done in a moment, and the bird, as it leaves the flower, sips so small a portion of its liquid honey, that the theft, we might almost suppose, is looked upon with a grateful feeling by the flower, which is thus kindly relieved from the attacks of her destroyers. The prairies, the fields, the orchards and gardens, nay, the deepest shades of the forest, are all visited in their turn, and everywhere the little bird meets with pleasure and food. Its gorgeous throat, in beauty and brilliancy, baffles all competition. Now it glows with a fiery hue, and again it is changed to the deepest velvety black. The upper parts of its body are of resplendent changing green, and it throws itself through the air with a swiftness and vivacity hardly conceivable. It moves from one flower to another like a gleam of light, upwards, downwards, to the right, and to the left. In this manner it searches the extreme northern portions of America, following with great precaution the advances of the season, and retreats with equal care at the approach of autumn.

These birds do not alight on the ground, but easily settle on twigs and branches, where they move sideways in prettily-measured steps, frequently opening and closing their wings, pluming, shaking, and arranging the whole of their apparel with neatness and activity. They are particularly fond of spreading one wing at a time, and passing each of their quill-feathers through the bill, in its whole length, when, if the sun is shining, the wing thus plumed is rendered extremely transparent and light. They leave the twig, without the least difficulty, in an instant, and appear to be possessed of superior powers of vision, making directly towards a martin or a blue-bird, when fifty or sixty yards from them, and reaching them before they are aware of their approach. No bird seems to resist their attacks; but they are sometimes chased by the larger kinds of humble-bees, of which they seldom take the least notice, as their superiority of flight is sufficient to leave these slow-moving insects far behind them in the short space of a minute.

"Where," says Audubon, "is the person who, on seeing one of these lovely little creatures moving on humming winglets through the air, suspended as if by magic in it, flitting from one flower to another with motions as graceful as they are light and airy, pursuing its course over our extensive continent, and yielding new delights wherever it is seen;—where is the person, I ask of you, kind reader, who, on observing this glittering fragment of the rainbow, would not pause, admire, and instantly turn his mind with reverence to the Almighty Creator, the wonders of whose hand we at every step discover, and of whose sublime conceptions we everywhere observe the manifestations in his admirable system of creation?"

Humming-birds in general may be said to inhabit chiefly the intra-tropical regions of America, including the West Indies; but that they are capable of sustaining a considerable reduction of temperature, and of spreading themselves into comparatively rigorous climes, is evident from the observations of Captain King, who, in his survey of the southern coasts, met with numerous examples of these diminutive creatures flying about in a snow-storm, near the straits of Magellan; and discovered two species in the remote island of Juan Fernandez. Two other hardy species have been long known to migrate during summer far into the interior of North America—viz., the ruff-necked humming-bird (*T. rufus*), discovered during Cook's voyage in Nootka Sound, and since traced by Kotzebue to the 61st degree of north latitude, along the western shores; and the ruby-throated humming-bird (*T. colubris*), which was found breeding, by Mr. Drummond, near the sources of the Elk River, and is known to reach at least as far north as the 57th parallel.

The best and most ample history of these "feathered gems" may be gathered from the pages of Audubon and Wilson, while the superb adornment of their beautifully pencilled plumage, so rich in its varied combinations of lustrous green and gold, may be studied with advantage in the sumptuous pages of M. Lesson and Mr. Gould. They are of a most lively and active disposition, almost perpetually upon the wing, and darting from flower to flower with the busy rapidity rather of a bee than a bird. In the uncultivated districts of the country, they inhabit the forests, but in peopled regions they flock without fear into the gardens, poising themselves in the air, while they thrust their long extensile tongues into every flower in search of food.

According to Bullock, they will remain suspended in a space so small, that they have scarcely room to move their wings, and the humming noise which they produce proceeds entirely from the prodigious velocity with which they vibrate those tiny organs, by means of which they will remain in the air almost motionless for hours together. An old writer, Firmin, a physician of Surinam, compares this action to that of the bee-like flies, which in still and sultry weather we often see hovering in the vicinity of still waters; and Wilson says, that when a humming-bird arrives before a thicket of trumpet flowers in bloom, he suspends himself so steadily that his wings become "invisible or like a mist." They often enter windows, and after examining any fresh bouquets with which fair hands may have decked the table, they will dart like sunbeams out by an opposite door or window. During the breeding season, they become jealous of encroachments, and exhibit great boldness in defence of their supposed rights. When any one approaches their nest, they will dart around with a humming noise, frequently passing within a few inches of the intruder's head. A small species, called the Mexican star (*T. cyanapogon*), is described by Mr. Bullock as exhibiting great intrepidity while under the influence of anger. It will attack the eyes of the larger birds, striking at them with its sharp, needle-like bill; and when invaded by one of its own kind during the breeding season, their mutual wrath becomes immeasurable, their throats swell, their crests, tails, and wings expand, and they fight in the air till one or other falls exhausted to the ground. Indeed, old Fernando Oviedo gives a still more alarming account of their fiery temper. "When they see a man climb ye tree where they have their nests, they flee at his face, and stryke him in the eyes, commying, goying, and returnyng with such swiftness, that no man would ryghtly believe it that hath not seen it."

THE TOPAZ-THROATED HUMMING-BIRD.

Various attempts have been made, with more or less success, to rear these beautiful little birds in confinement. One which was captured by Wilson, though quite young, refused to take food, and in a few hours it could only just be detected that life remained. A lady, however, undertaking to be its nurse, placed it in her bosom, and as it began to revive, dissolved a little sugar in her mouth, into which she thrust its bill, and it sucked with avidity. In this manner it was brought up till just fit for the cage, and it lived for upwards of three months. It was supplied with loaf-sugar dissolved in water, which it preferred to diluted honey; and every morning it had fresh flowers sprinkled with the liquid, from one to another of which it hovered with great activity and spirit, as if in its native wilds; always expressing by its motions and voice great pleasure when fresh flowers were introduced to the cage. The space in which it was kept was surrounded with gauze, so as to prevent the bird injuring itself, and every precaution was adopted in order to keep it during the winter; but, unfortunately, it got at large into the room, and flying about, so injured itself that it soon afterwards died.

The humming-bird is extremely susceptible to cold, and if exposed to it death speedily ensues. A beautiful male specimen was preserved by Wilson in 1809, which he put into a wire cage, and placed in a retired and shaded part of a room. "After fluttering about for some time," he says, "the weather being uncommonly cool, it clung by the wires, and hung in a seemingly torpid state for a whole forenoon. No motion whatever of the lungs could be perceived, on the closest inspection, though, at other times, this is remarkably observable; the eyes were shut; and when touched by the finger, it gave no signs of life or motion. I carried it out to the open air, and placed it directly in the rays of the sun, in a sheltered situation. In a few seconds respiration became very apparent: the bird breathed faster and faster, opened its eyes, and began to look about, with as much seeming vivacity as ever. After it had completely recovered, I restored it to liberty; and it flew off to the withered top of a pear-tree, where it sat for some time dressing its disordered plumage, and then shot off like a meteor."

THE TOPAZ-THROATED HUMMING-BIRD.*

Such is a representation of the male and female of one kind of these beautiful birds. The nest is usually attached to the upper side of some horizontal branch; but sometimes the branch is inclined, as in the present instance. The nest is about an inch in diameter, and as much in depth, and is formed externally of a species of gray lichen, the portions of which are said to be glued together by the saliva of the bird. Within this outer coat is a padding of the cotton or down of plants, smoothly arranged, and lined with a yet finer layer of silky fibres; the eggs are two, and of a transparent fineness. The young ones take their food by putting their bills into the mouths of the parent birds.

This is a large species, and, without exception, one of the most splendid of the whole race. In every part the plumage is composed of the scaly-formed feathers which are always present where a metallic lustre prevails; and in every position its brilliant colours receive a variation of tint differing from that last seen, and superior in splendour to anything with which we could compare it.

The length of this bird, not including the long centre tail-feathers, is five inches and a half; these exceed the others by nearly three inches; the colours of the whole plumage of the body may be said to be of a rich brownish-orange, in some lights appearing of the deepest crimson, and in others of a brilliant ruby colour tinted with gold; on the lower surface the golden lustre is most prevalent above the deep shade and ruby tint; the gorget is alternately of a topaz-yellow or emerald-green, and it is surrounded by a shade of nearly velvet-black, which gradually assumes a purple tint, and shades into the colour of the body: the wings are very long and powerful; the tail is above of a golden-green, shaded with red, below of a bright chestnut; in form it is rather rounded, and the two centre feathers make it appear sometimes very lengthened, sometimes forked, according to their position; the tarsi are feathered to the division of the toes.

The female is smaller than the young males; the centre tail-feathers are slightly larger; the prevailing colour of the plumage is bright emerald-green, with metallic lustre, but which is somewhat diminished by a gray tint which pervades the whole; the gorget is marked by brown feathers, which have a golden lustre when placed in the light, but is not very distinctly defined; the outer tail-feathers are of a dull green, the next pair are of a brilliant violet, the others of a bright chestnut.

The young have not the long feathers in the tail, the two centre plumes of which exceed the others by about one-eighth of an inch; the plumage of the upper part is of a bright green, with the ruby tints appearing at intervals; the under part has more of the red colour, and is shaded with green and bright orange; the gorget is not yet apparent, but the space for it is clearly seen.

THE RUBY-THROATED HUMMING-BIRD.†

Mr. Abbot, of Savannah, in Georgia, whose observations in reference to natural history subjects in that country have been careful and long continued, states that the humming-bird of the United States makes its first appearance there from the south towards the close of March. As it passes on to the north, and to the interior of Canada, where it is found in great numbers, it traverses extensive regions of lakes and forests, which are thronged with enemies far its superior in magnitude and strength; yet it finds protection in its very minuteness in the rapidity of its flight, which almost eludes the eye, and in that admirable instinct and daring courage by which it is characterised. In these we perceive the reason why an all-wise Providence has made this little hero an exception to the rule which prevails most generally—that the smallest species of a tribe is the most prolific. The eagle lays one and sometimes two eggs; the crow five; the small European wren fifteen; and the humming-bird only two; and yet it is immeasurably more numerous in America than is the wren in Europe.

Towards the close of April the humming-bird usually arrives in Pennsylvania, and about the 10th of May proceeds to build its nest. This is generally fixed on the upper side of a horizontal branch, though cases are recorded in which it has been attached to the side of an old moss-grown trunk, or to a strong rank stalk or weed in a garden; but such cases are rare. If it builds in the woods, it very often chooses a white oak sapling on which to rest the nest; while in the orchard or garden a pear-tree answers the same purpose. The nest is about an inch wide and deep. In one which has been completely finished with the best materials, it will probably be found that the outward coat is formed of small pieces of the lichen that grows on old trees and fences, glued together with a saliva which the bird exudes, which gives firmness and consistency to the whole, and serves also to exclude moisture. Within this are thick matted layers of the wings of certain flying seeds, which is, perhaps, lined with some downy materials supplied by other plants. The base of the nest is continued round the stem of the branch to which it closely adheres; and, when viewed from below, appears as a mere mossy knot or accidental protuberance. The eggs are two in number, of a pure white colour, and of equal thickness at both ends. Should any one approach the vicinity of the nest, the parent birds dart around, with a humming sound, passing frequently within a few inches of the head of the intruder; and should the young be newly hatched, the female will resume her place on the nest, even while the visitor stands within a yard or two of the spot. A short time before the young leave the nest, they may often be seen thrusting their bills into the mouths of their parents, and sucking what they may have brought them to eat.

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* Trochilus pella: Linnæus.

† Trochilus colubris: Wilson.

This humming-bird manifests great partiality for tubular flowers, and its manœuvres among the blossoms of the trumpet-flower are very interesting. Wilson, who has often watched them, states, that when they have arrived before a thicket of these plants, which are, perhaps, in full bloom, he poises himself in the air for the space of two or three seconds, and the observer can plainly detect the pupil of his eye looking round with great quickness and circumspection, while the glossy golden-green of his back, and the fire-like hue of his throat dazzling in the sun, form altogether a most interesting appearance. The position into which his body is thrown while in the act of thrusting his slender tubular tongue into the flower to extract its sweets, is also very curious. When he alights, which he does frequently, he always prefers the small dead twigs of a tree or bush, where he arranges his plumage with great dexterity.

Some of the humming-birds are not only remarkable for the brilliancy of their colours, but for the tufts and plumes by which they are adorned. Of these, therefore, we shall give some instances.

THE TUFTED-NECKED HUMMING-BIRD.*

This exquisite little creature is a native of Cayenne, Brazil, and Guiana. It prefers dry arid plains clothed with a scanty and bushy vegetation. Its head is ornamented with a crest of red feathers, and from the sides of the neck proceeds a tuft composed of twelve or fourteen feathers of the same colour, ending each in a broad tip of clear shining green. The chest is dotted with scaly feathers of a bright emerald-green, paler at its edges. The upper parts are golden-green, the lower greenish-brown; the tail is large, having the centre feathers green, the others red, with a purple gloss. The female wants both crest and throat-plumes, but in the metallic richness of her tints is hardly inferior to her mate.

GOULD'S TROCHILUS.†

This is a most elegant species, named after the justly-celebrated naturalist to whom we owe so many delightful specimens of humming-birds, an acquaintance with numbers previously unknown to ornithologists, and numerous descriptions of great clearness and accuracy. He says:—"The native district of this splendid species is unknown. The forehead, throat, and upper part of the breast are of the most brilliant green, the feathers of a scaly form; from the crown springs a beautiful crest of bright chestnut feathers, of a lengthened form, and capable of being raised at pleasure; the back and upper parts are golden-green, crossed upon the rump with a whitish band; the wings and tail are brownish-purple, the latter having the centre feathers tinged with green. The neck-tufts are of the most splendid kind, and have a chaste but brilliant effect: they are composed of narrow feathers of a snowy whiteness, the tips of each having a round spot of bright emerald-green, surmounted by a dark border."

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* Trochilus ornatus.

† Trochilus Gouldii.

THE SUPERCILIOUS HUMMING-BIRD.*

This species is found both in Guiana and Brazil. The bill is long and bent, considerably dilated at the base, and, as in all the genus, has the under mandible entering, when closed, within the upper one; the base is of a bright orange. The upper plumage of the bird is of a bronzed-green; two reddish-white lines mark the cheeks; the one more in the shape of a spot above the eye, the other in a line from the corner of the mouth; all the lower parts are of a brownish-white.

The tail, without the long feathers, is wedge-shaped, each feather widening towards the tip, and then ending in a triangular sharp point; the long feathers keep the breadth of the others for the same length, when they suddenly become narrow, and form the distinguishing marks of the male. The colour of the tail is bronzed-green, shaded nearly to a rich black at the ends, which terminate in a narrow border of white; the projecting ends of the long feathers are also white.

On presenting a humming-bird to an ordinary observer, the first exclamation is, "What a beautiful creature!" "But what large wings it has!" usually follows. Such, indeed, is the case, and in most instances, the size of the wings and strength of the quills are entirely disproportioned to our ideas of symmetry in a creature clothed with feathers; but on comparing them with other parts of its frame and its necessities, their design and utility are at once apparent.

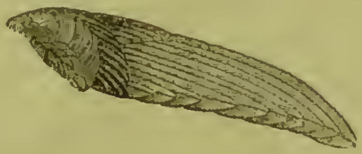
HEAD OF ORNISMIA ANGELÆ.

HEAD OF ORNISMIA SUPERBA.

HEAD OF TROCHILUS ENSIFERUS: BOISSONNEAU.

The form of the wings is very similar to those of the swift, whose power of flight is well known. In general they exceed the tail in length, unless when that member is extraordinarily developed.

HEAD OF ORNISMIA LATIPENNIS.


WING OF ORNISMIA LATIPENNIS: LESSON.

The exterior outline of the wing is very much curved, as will be observed in the figure of one of the *Ornismia latipennis*, and the first quill is always longest, the others gradually shortening. The secondaries are very short, and the lesser wing-coverts occupy very little room. The plumelets of the quills are narrow and compact, firmly united together, forming a substance, when used, almost like a thin plate of whalebone, and which, by presenting resistance to the air when struck, and allowing no part to pass through the webs, as in nocturnal feeding birds, produces that humming sound which is heard during their suspension, and whence their common name has been derived. In all, the shafts are remarkably strong and elastic; but in a few species, called "sickle or sabre-winged humming-birds," they are developed to an extraordinary degree at the base, and nearly equal the breadth of the plume.

The reason for such a structure is obvious. Its great purpose is the power of vigorous and sustained flight. Hence all the other parts not then called into action are very slender, almost frail; the tarsi are short, and the feet small. Here the wisdom and benevolence of the great Creator are manifest; for the food of these birds is derived from the sweet nectar of flowers, or from insects which must either be taken during a rapid flight, or withdrawn from the deep tube or cup-shaped recesses of blossoms which grow and hang in every direction, and which it would be impossible to reach except by suspension above or under them.

But this is not all. Another great reason for their possessing organs of such power is, to enable them to pass safely through the migrations and the long flights which are sometimes necessary for their preservation, and during which they have often to withstand a passing gale, showers, or even the rigour of a snow-storm. The beautiful climes which they inhabit are, at certain seasons, subject to perpetual rains, which drench and almost inundate their abodes; or to hurricanes that, in a few minutes, leave only a wreck of all that was before so magnificent and luxuriant; and they pass, by these means, before the dangerous season, to districts where the reparation of a previous wreck is proceeding with all the magical rapidity of tropical vegetation.

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* Trochilus superciliosus.

The bill is always an important organ in birds. This family presents great modifications in its form, as shown in the figures which are given on the preceding page. In a few species the edges of the mandibles are toothed; and, in one, this member is furnished with recurved, saw-like teeth—a manifest provision for more effectually securing some peculiar prey. Thus, when Swainson is describing the recurved-billed humming-bird, he says:—"The extraordinary formation in the bill of this beautiful little creature is without parallel in any land-bird yet described. It is almost impossible to conjecture rightly the use of this singular formation; but it appears to me not improbable, that the principal sustenance of the bird may be drawn from the pendant bignonaceæ, and other similar plants, so common in South America, whose corollæ are long, and generally bent in their tube; and so, the nectar being at the bottom, could not be reached either by a straight or a curved bill, though very easily by one corresponding to the shape of the flower."

THE SUPERCILIOUS HUMMING-BIRD.

The tongue of humming-birds is very long, retractile, and capable of being darted out with considerable force. It is said, by Brisson and Lesson, to be composed of two muscular tubes joined together for the greater part of their length, towards the tip broadened or swelling, and terminating in a spoon-like point on the upper surface.

We have alluded to some of the forms and decorations of these exquisite creatures, but the diversities are too numerous for particular description. As a contrast to the ruby-throated and topaz-throated, for example, some have a throat of brilliant white, descending a little like a lady's tucker, but, as if to compensate for this simplicity of colour, there is on each side an emerald sheen, and all around is set, as it were, with gems of the same splendid hue. In some instances this radiant tint adorns the stomacher, and is heightened in effect by the richest ultramarine, which is profusely scattered over the head and the long feathers of the tail. Other cases there are in which the same part of the body is arrayed in feathers having the form of a lady's ruff or tippet, set off, at the sides, by the most brilliant hue. But there is an almost endless diversity: thus, the head and wings are sometimes plain in hue, while the body is of the brightest mingled dyes; at other times, the tails are especially resplendent, the vivid colours passing over the whole surface, or broadly edging them, and leaving in

HUMMING BIRDS.

the centre a streak or space of white; tufts of dazzling brilliancy not unfrequently adorn the head, or fall downwards from the beak; while the legs are like those of other small birds, except that they are unusually short, or emerge from little bushes of small feathers, technically called "boots," which are either white, black, or of various hues. To this brief and general description, it may be added, that no fewer than three hundred and twenty-five species of humming-birds are now known, although the celebrated Linnæus was acquainted with extremely few; that the bills vary in different individuals, those of the young being longer than those of adult birds; and that the plumage of the sexes is often widely different, the female being devoid of the rich lustrous green on the throat, and having only a rudiment of white boots, which are both so conspicuous in the males.

To see these "winged gems" in all their beauty and splendour, the great archipelago of islands between Florida and the mouths of the Orinoco should be visited, as well as the mainland of the southern continent until it passes the tropic of Capricorn. That, indeed, is no ordinary region for natural beauties. As the voyager approaches the land, he beholds, perhaps, immense ridges of primitive mountains, traversed by deep ravines, and rising in succession to the very boundary of his vision. His eye may be delighted, too, by the brilliant tints of the foliage which covers these lofty heights, and by the dazzling insects which flutter about his ship, indicating the stores of animated Nature. As he lands, and bends his way to the rocky woods, he may well be overwhelmed by his first sensations on beholding the productions of a tropical climate in their native soil. Plants, reared in England only at great expense, and which even then attain but a puny and uncharacteristic form, flourish around him in all the vigour and luxuriance of their perfect existence. Surrounded by lofty airy cassias; broad-leaved, thick-stemmed cecropias; thick-ermined myrtles, large-blossomed bignonias, climbing tufts of the honey-bearing paullinias, far-spreading tendrils of the passion flower, and of the richly-flowering coronilla, above which rise the waving summits of Macauber palms, he seems to realise the fable of the garden of the Hesperides. The glory of these southern forests, the endless variety of forms, the contrasts of colour and size, the brilliant blossoms of even the largest trees; the scarlet, purple, blue, rose-colour, and golden-yellow, blending profusely with every possible shade of green, language is altogether unequal to describe. Here branches may be observed covered on the under side with a hoary down, which, in the heat of the day, they turn up to the sun, so that whole patches of the surface seem covered with rich white blossoms; while, strikingly contrasted, there appears the coral tree, whose spikes of rich scarlet blossoms stand erect, rivalling in size those of the horse-chestnut of our own spring-time, and giving to the surface a glow of the brightest red; or the yucca, with its tulip-like flowers of the most vivid hues. There, moreover, are all the varieties of the cactus tribe, of which one of the most splendid is the night-blowing cereus—a flower of surpassing beauty; for its blossoms are nearly a foot in diameter, and the outer petals of a dark brown, while the inner ones are of a splendid yellow, which gradually shades off to the most brilliant white.

> "Soft roll your incense, herbs, and fruit, and flowers,
> In mingled clouds to Him whose sun exalts,
> Whose breath perfumes you, and whose pencil paints."

One season, too, is peculiarly favourable. In the months of July and August, when the tree denominated *bois immortel* yields an abundance of bright red blossoms, which stay on its branches for several weeks, the different species of humming-birds are very plentiful; then, too, they buzz like bees around the rich blossoms of the wallaba tree; indeed, there is scarcely a flower in the interior, or on the sea-coast of the isles they inhabit, which is not frequently visited by these radiant beings. They may be observed, as soon as the sun is risen, fluttering about the brilliant petals, but without ever lighting upon them. So rapid, however, is the motion of their wings, that only the glittering, and not the colours of them, can possibly be discerned. And as they pass onwards, now perhaps within a yard of the observer's face, yet gone in an instant, they look indeed like winged, but changing, gems—now a ruby, now an amethyst, now an emerald, and anon like glowing and burnished gold.

One species alone never shows its beauty to the sun; and, were it not for his lovely colours, the naturalist would be almost disposed to remove him from the tribe of humming-birds, and to class him with the goat-suckers, because of his habits. He is the largest and longest of the humming-birds, and is of mingled red and a changing gold green, except the head, which is black, as are also two long tail-feathers, which cross each other. He is never found on the sea-coast or where the water is salt, or about the trees of a forest, except fresh water be there. He keeps by the side of the woody fresh-water rivers and dark and lonely creeks, leaving his retreat before sunrise to feed on the insects hovering over the water, returning to it as soon as the rays of the solar orb cause a glare of light, continuing sedentary all day long, and only emerging again a short time after sunset. What a singular exception does he present to the general habits of his race!

We conclude our account of this interesting tribe with one more fact. A young man, a few days before his departure from Jamaica, surprised a female humming-bird in the act of incubation, caught it, removed the branch on which the nest was, and carried them very carefully on board the ship. The little creature became sufficiently tame, during the passage, to suffer herself to be fed with honey and water, and actually hatched her offspring; but she died at the close of the voyage. Two young ones, however, survived it, and came into the possession of Lady Hammond and Sir Henry Englefield. These birds were sufficiently tame to take honey with their bills from the lady's lips; but one of them speedily died, and the other only lived two months after its arrival.

THE NUTHATCH.*

THE weight of this bird is nearly an ounce; the length, five inches and three-quarters, and the expanse of the wings nine inches. The tints of the female are weaker than those of the male, especially about the sides and thighs.

THE NUTHATCH.

This species inhabits Europe and Asia, and seems to be little affected by the influence of climate. In Britain, as in most other countries, it is stationary, but local, and chiefly prefers wooded and inclosed situations, frequently selecting the deserted habitation of a woodpecker for its nest. In this case the entrance to the hole is first contracted by a plaster of clay or mud, to exclude larger birds, and leaving only sufficient room for itself to pass in and out. The male and female jointly labour at the construction of the nest, which usually consists of dead leaves and moss heaped together without much order, and sometimes lined with the dust of the decayed tree in which the nest is placed. The number of the eggs is generally six or seven, and they are of a dirty white with dusky spots, being scarcely distinguishable from those of the greater titmouse. If the plaster at the entrance be destroyed when there are eggs in the nest, it is speedily replaced.

During incubation, the female is assiduously attended by the male, who regularly supplies her with food. Though easily driven from her nest at other times, she sits on her eggs with great pertinacity, striking the invader with her bill and wings, and hissing like a snake; and after every effort has been practised in vain, she will rather suffer herself to be taken than desert her charge. The eggs are hatched in May; and there is rarely more than one brood in the season. After the young can provide for themselves the family separates, and all seek retirement, though they are occasionally observed to mingle with titmice and woodpeckers.

Although the nuthatch spends much of its time in climbing or creeping on trees, its motions are nimbler than those of the sparrow, as well as smoother and more connected, for it makes less noise in flying. In climbing it is more expert than the woodpecker, for it runs up and down the tree in all directions. When employed in breaking a nut, its favourite position is with the head down. In the autumn it is no uncommon thing to find in the crevices of the bark of an old tree a great many broken nutshells, the work of this bird, which repeatedly returns to the same spot for this purpose. When it has fixed the nut firm in a chink, it turns on all sides to strike it with the most advantage. This, with the common hazel-nut, is a work of some labour, but it strikes a filbert with ease. Whilst at work it makes a rapping noise, which may be heard at some distance. In default of nuts and seeds, this bird searches for insects and their larvæ among moss or old trees, or walls, thatch, &c. In winter it picks the larvæ of beetles from under the bark of trees, and has recourse to the magazine of nuts, and the seeds of sun-flower.

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* Sitta Europæa.

In concluding our exposition of the tenuirostral tribes, we now approach the *Hoopoes*, in close approximation to which is placed the genus *Fregilus* of Cuvier, containing the *Corvus graculus*, or red-legged crow of British writers. It is, in truth, so nearly allied to the Alpine crow (*C. pyrrhocorax*), or *choucard des Alpes*, both in structure and habits, and is so often seen in company with that species, that wherever the one may be placed, the other should not be far distant. M. Temminck, indeed, places them in the same genus, although the bill of the red-legged bird, or Cornish chough, is longer than the head, more subulate, and slender at the point, and without any notch. Cuvier regards the *Corvus affinis* of Latham, and another species from New Holland, as both belonging to the genus *Fregilus*.

THE HOOPOE.

THE HOOPOE.*

This bird is the Epops† of the Greeks; and the Upupa and Epops of the Romans. Ovid describes it to the life as he thus pictures the metamorphosis of Terens:—

> "Terens, through grief, and haste to
> be reveng'd,
> Shares the like fate, and to a bird is
> changed.
> Fixed on his head the crested plumes
> appear,
> Long is his beak, and sharpen'd as a
> spear."

The arched crest upon the head is formed by two parallel rows of long feathers, of a ruddy buff colour, terminated with black. The female is less than the male, her crest shorter, and the tints of her plumage less vivid. The only European species (*U. epops.*—Linn.) is a summer bird of passage on the continent, where it travels northward as far as Sweden. It never breeds in Britain, though it sometimes accidentally occurs there. One was sent to London a few years ago from the county of Fife. This bird is called *bubbola* by the Italians, most likely from its peculiar cry. It keeps itself concealed among the trees; but is constantly heard repeating the syllable *bu, bu, bu, bu, bu,* with such a strong, sonorous voice, that it may be heard at a great distance. Its song, properly so called, is only uttered during the honeymoon. Although the hoopoe lives and builds in woods, it may be often seen in search of insect food, in fields and pastures. The nest is generally placed either in the natural hollow of a tree, or in the deserted excavation of a woodpecker. It is composed outwardly of feathers, and is lined with the hair of cows and horses. The eggs are grayish-white, finely spotted with brown. This bird is very common in Egypt. A nearly allied species (*U. Capensis*) is found at the Cape, and occurs also in the East Indies; but we presume M. Savi is in error when he says the genus is likewise known in America. In this bird the frontal plumes are developed very remarkably; its plumage is white, with a grey tinge.

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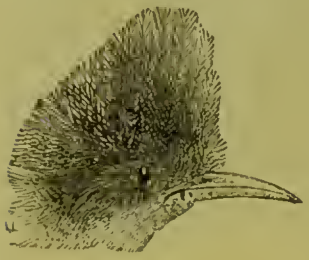
* Upupa epops.

† Εποψ.

White remarks, in his "Natural History of Selborne:" "The most unusual birds I ever observed in these parts were a pair of hoopoes, which came several years ago in the summer, and frequented an ornamented piece of ground, which joins to my garden, for several weeks. They used to march about in a stately manner, feeding on the walks, many times in the day, and seemed disposed to breed in my outlet, but were frightened and persecuted by idle boys, who would never let them be at rest."

Mr. Bartlett, a preserver of birds, in Museum-street, London, had a hoopoe. It was quite tame, and, when unexcited, the high crest fell over the top of the head and covered the occiput; it took a meal-worm from the hand very readily, nibbled and pinched it between the ends of the mandibles, then put it on the ground, and struck it several blows with the point of its beak; when the insect was apparently disabled or dead it was again taken up, and, by a particular motion of the head, which was thrown backwards, and the beak being opened, the meal-worm dropped into the gape of the mouth and was swallowed. The call for another was a sharp note; but the hoopoe also uttered at times a sound closely resembling the word *hoop*, *hoop*, *hoop*, yet breathed out so softly and rapidly as to remind the hearer of the note of the dove. This bird constantly rubbed itself in the sand with which the bottom of its large cage was supplied, dusting itself like the larks, but taking great care to shake off any sand or gravel that might adhere to its food, which was raw meat chopped and boiled eggs.



THE CAPE HOOPOE.

THE CAPE PROMEROPS.

At the moment of settling on the floor of the room, this bird bent its head downwards till the point of the beak touched the floor, after which, as well as occasionally at other times, the long feathers forming the crest were alternately elevated and depressed in a slow and graceful manner, the bird assuming an appearance of great vivacity, running on the ground with a very quick step.

One genus* has also an elongated, slender bill, finely pointed, laterally compressed, somewhat convex above, with the nostrils open and cleft longitudinally. The tail is very long and graduated, and the tongue is extensile and bifurcated, so that the species are enabled to absorb the nectarous juices of flowers. The title seems now restricted to the African species, of which the only one distinctly known is the Cape promerops,† of a grayish-brown above, with a white throat, bordered by two dark lines, the breast reddish, the abdomen yellow. The tail is of great length during the completed plumage; but the long, ribbon-like feathers are often absent, which greatly alters the external characters of the bird.

Another genus‡ was found by Mr. Gould in New Zealand, abounding on the hills around Port Nicholson, and indigenous to the island. They subsist on insects and fruits, and are exceedingly familiar, approaching so closely to strangers as to be readily captured or killed. We give an engraving of one of the species.§

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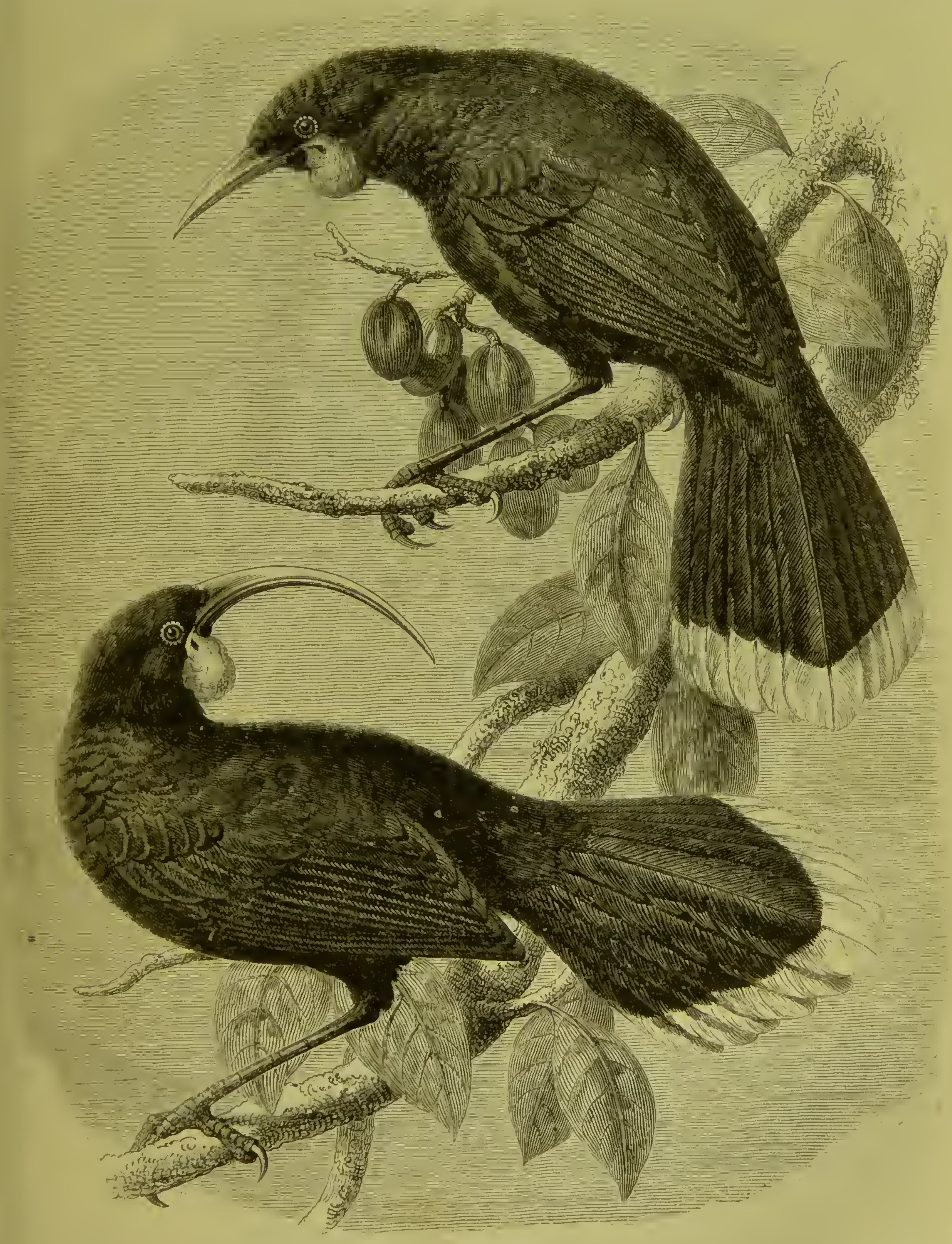
* Promerops: Brisson.

† Promerops Capensis, Merops Caffir: Gmelin.

‡ Neomorpha.

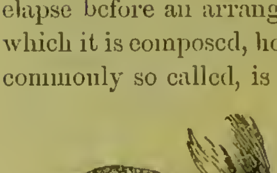
§ Neomorpha Gouldii.



GOULD'S NEOMORPHA.

CLIMBING BIRDS.*

This Order may be pronounced somewhat heterogeneous, and considerable time will yet most probably elapse before an arrangement will be made of strictly allied groups. The great majority of the species of which it is composed, however, have two toes before and two behind; that is, one of the three anterior toes, commonly so called, is either reversible at pleasure, or is permanently thrown backwards, so as to give great power and tenacity of grasp during their infinitely varied movements over the rugged bark or smoother branches of the forest trees on which they chiefly dwell. By this peculiar structure many species are enabled not only to ascend with ease a perpendicular bank, but to suspend themselves from the lower surface of a branch while searching for their favourite food, which consists of fruits or insects, according to the form of the bill, so greatly diversified in the present order. In the parrot tribe the foot is also used in the conveyance of food to the mouth, and, generally, as a very perfect prehensile organ.



FOOT OF PARRAKEET.

The birds of this order generally build in holes of trees; their power of flight is not considerable; their food, like that of birds in the preceding order, consists of insects and fruits, accordingly as their bill is more or less strong. Some, as the woodpeckers, have peculiar means of obtaining food.

THE JACAMARS.†

These birds are nearly allied to the kingfishers in certain respects, as in their elongated, sharp, quadrangular bill, and in their short feet, whose anterior toes are, for the most part, united. But these toes have not exactly the same formation as in the kingfishers; the plumage is not so smooth as that of those birds, and has always a metallic lustre. They live solitarily in humid woods, feed on insects, and build their nests on low branches.

The American species have the bill larger than the others, and quite straight.

THE CUCKOOS.

In one genus‡ were originally placed a number of different insectivorous birds, commonly called cuckoos, which agreed in the general form of the feet, the lengthened tail, the bill of medium size.

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* Scansores. Zygodactyli, or, Yoke-footed.

† Galbula: Bress.

‡ Cuculus: Linnæus.

rather deeply cleft, somewhat compressed and slightly curved. But they have since been formed into numerous minor groups, the most marked and conspicuous of which we shall here briefly notice.

The true cuckoos * have the bill of moderate strength, the tarsi short, and the tail of ten feathers. As an example, we name our British species, *C. canorus*, so remarkable for its singular and somewhat anomalous habit of depositing its eggs in the nests of other birds, a fact now well known, but to which we shall briefly refer. The nest of the hedge-sparrow (*Accentor modularis*) is that most usually chosen in the south of England; that of the yellow-ammer, the wagtail, and the meadow titlark being, however, likewise devoted to the purpose. "In Northumberland," says Mr. Selby, "constant experience tells me, that the nest of the last-mentioned bird is the one almost always chosen. Taking advantage of the absence of its dupe during the time of laying (which generally occupies four or five days), the cuckoo deposits its egg among the rest, abandoning it from that moment to the care of the foster-parent. As the same period of incubation is common to both birds, the eggs are hatched nearly together, which no sooner takes place than the young cuckoo proceeds instinctively to eject its young companions, and any remaining eggs, from the nest. To effect this object, it contrives to work itself under its burden (the back at this early age being provided with a peculiar depression between the shoulders), and shuffling backwards to the edge of the nest, by a jerk rids itself of the incumbrance; and this operation is repeated till, the whole being thrown over, it remains sole possessor. This particular tendency remains for about twelve days, after which the hollow place between the shoulders is filled up; and when prevented from accomplishing its purpose till the expiration of that time, as if conscious of inability, it suffers its companions to remain unmolested."

THE CUCKOO.

Various supposed reasons have been assigned for this anomalous, and we might almost say unnatural instinct. Some have attributed it to the displacement of certain viscera (the gizzard is said to be situate further back than in most other birds), which unfits the cuckoos for the purpose of incubation, while others imagine that the early period at which they migrate from this country (they are generally off by the beginning of July) makes it necessary that they should leave their offspring to the care of foster-parents. But anatomical investigation has not proved anything sufficiently peculiar in their structure to warrant the first conclusion; and as to the second, it seems to us not so much a deduction from a regulating and causative fact in their history, as the statement of an additional circumstance which renders that history still more singular, and which naturally leads to the question not easily answered, of why do they migrate so early? In short, we know nothing at all about the matter, further than that the cuckoo of Europe, like the cow-bunting of America,† always lays eggs, but never hatches them. It may be a practice common to several species, but the rare black and white spotted cuckoo,‡ an odd name for an African bird which happened once upon a time to visit Tuscany, is stated by the authors of the *Storiadegli Uccelli* to have *built a nest* in the woods of Pisa, and *reared four young ones.* This species is extremely rare in Europe. It is known, however, in the Genoese territory, and the young have been occasionally killed in the south of France. Many beautiful cuckoo are found in foreign countries

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* Cuculus: Cuvier. † See page 150. ‡ Cuculus pisanus: Gmelin.

According to Aristotle and Pliny, and with them Linnæus appears to have concurred, the young cuckoo, when it had attained a sufficient size, would sometimes kill and eat its foster-mother. Hence Shakespeare makes the *Fool*, in "Lear," say, alluding to the unnatural conduct of the unhappy king' daughters :—

"The hedge-sparrow fed the cuckoo so long,
That it had its head bit off by its young."

"I had an opportunity," says a naturalist, "of witnessing a singular fact in the case of a young cuckoo which was hatched in the nest of a water-wagtail, who had built in some ivy on a wall close to my house. It required the united efforts of both the old birds, from morning to night, to satisfy his hunger, and I never saw birds more indefatigable than they were. When the young cuckoo had nearly arrived at his full size, he appeared on the little nest of the water-wagtail, 'like a giant in a cock-boat.' Just before he could fly he was put into a cage, in which situation the old birds continued to feed him, till, by some accident, he made his escape, and remained in a high elm-tree near the house. Here the water-wagtails were observed to feed him with the same assiduity for at least a fortnight afterwards."

The following circumstances occurred at Arbury, in Warwickshire, the seat of Francis Newdigate, Esq., and were witnessed by several persons residing in his house. The particulars were written down at the time by a lady, who bestowed much time in watching the young cuckoo, and the fact is given in her own words :—"In the early part of the summer of 1828, a cuckoo, having previously turned out the eggs from a water-wagtail's nest, which was built in a small hole in a garden wall at Arbury, deposited her own egg in their place. When the egg was hatched, the young intruder was fed by the water-wagtails, till he became too bulky for his confined and narrow quarters, and in a fidgety fit he fell to the ground. In this predicament he was found by the gardener, who picked him up, and put him into a wire cage, which was placed on the top of a wall, not far from the place of its birth. Here it was expected that the wagtails would have followed their supposititious offspring with food to support it in its imprisonment—a mode of procedure which would have had nothing very uncommon to recommend it to notice. But the odd part of the story is, that the bird which hatched the cuckoo never came near it ; but her place was supplied by a hedge-sparrow, who performed her part diligently and punctually, by bringing food at very short intervals from morning till evening, till its uncouth foster-child grew large, and became full feathered, when it was suffered to escape, and was seen no more—gone, perhaps, to the country to which he migrates, to tell his kindred cuckoos (if he was as ungrateful as he was ugly when I saw him in the nest) what fools hedge-sparrows and water-wagtails are in England." It may possibly be suggested, that a mistake has been made with regard to the sort of bird which hatched the cuckoo, and that the same bird which fed it—namely, the hedge-sparrow—hatched the egg. If this had been the case, there would have been nothing extraordinary in the circumstance ; but the wagtail was too often seen on her nest, both before the egg was hatched, and afterwards feeding the young bird, to leave room for any scepticism on that point ; and the sparrow was observed feeding it in the cage afterwards by many members of the family daily.

"In April the cuckoo shows his bill ;
In May he sings both night and day ;
In June he altereth his tune ;
In July away he'll fly :
In August go he must."

This bird has long been one of the favourites of the poets. Thus Wordsworth sings :—

"O blithe new comer ! I have heard,
I hear thee and rejoice ;
O Cuckoo ! shall I call thee bird,
Or but a wandering voice ?

"When I am lying on the grass,
Thy two-fold shout I hear,
That seems to fill the whole air's space,
As loud far off as near.

"Though babbling only to the vale
Of sunshine and of flowers,
Thou bringest unto me a tale
Of visionary hours.

"Thrice welcome, darling of the Spring!
Ev'n yet thou art to me
No bird ; but an invisible thing,
A voice, a mystery.

"The same whom in my schoolboy days
I listened to; that cry
Which made me look a thousand ways,
In bush, and tree, and sky,

"To seek thee did I often rove
Through woods and on the green;
And thou wert still a hope, a love;
Still longed for, never seen.

"And I can listen to thee yet,
Can lie upon the plain,
And listen till I do beget
That golden time again."

THE GILDED CUCKOO.*

THIS beautiful bird inhabits the country above the Cape of Good Hope, being extremely common in Caffraria and Namaqua-land. The male utters a cry similar to the word *di-di-di-dric*, whence has arisen one of its names. Vaillant states that his servant, Klaas, shot 210 males, 130 females, and 103 young ones—in all, 443—and that numbers more might easily have been procured; adding, "besides which, eighty-three of their eggs in as many nests belonging to insectivorous birds, were obtained. Although this bird (the *didric*) be so common, if not in the immediate environs, yet about one hundred leagues from Cape Town, it was scarcely known in Europe before my voyage, and in France there was only one mutilated and badly-preserved specimen of it to be seen in the Royal Museum at Paris. I myself brought over one hundred and fifty males and females, as well as young ones, which are now exhibiting in the chief cabinets of Europe. To this beautiful species, also, I am indebted for my chief knowledge of the cuckoo family. From the facility I had of leisurely and successfully observing its manners, I always entertained the hope that I should one day surprise a female *didric* in the act of depositing its eggs in the nest of another bird; but having been disappointed in this respect, I began to imagine that my ignorance on this point would never be removed, when one day, having killed a female of this species, and wishing to introduce into its throat a plug of hemp, according to my custom, after bringing down a bird, in order to prevent the blood from staining its plumage, I was not a little surprised, on opening its bill for that purpose, to find in its throat an entire egg, which I knew immediately, from its form, size, and beautiful whiteness, to belong to the *didric*. Delighted at length, after so many useless efforts, at having obtained a confirmation of my suspicions, I loudly called my faithful Klaas, who was only a few paces distant from me, to whom I imparted my discovery with much pleasure, as he had used his best exertions to second my views. Klaas, on seeing the egg in the bird's gullet, told me, that after killing female cuckoos, he had frequently observed a newly-broken egg lying upon the ground, near where they had fallen, which, he supposed, they had dropped in their fall, being at that moment ready to lay. I recollect very well that when this good Hottentot brought me the fruits of his sports, he frequently remarked, as he pointed to the cuckoos, 'This one laid her egg as she fell from the tree.' Although I was convinced from this circumstance, that the female cuckoo deposits her egg in the nests of other birds, by conveying it in her beak, I was desirous to collect what facts I could on the subject. Klaas and I, therefore, began to shoot as many cuckoos as we could meet with, which accounts for the great number of this species we procured. However, among all the specimens there occurred only one instance similar to that which I just mentioned—namely, that of a second female, which was transporting her egg in her mouth like the former."

In length the gilded cuckoo is about seven inches; the plumage above is rich glossy-green with golden reflexions; the head is marked with fine small stripes of white, with which the secondary quills and many of the wing-coverts are tipped; the under parts are white; the tarsi yellow. In the female, the golden-green is changed for a reddish-gold colour, and the stripes on the head are more obscurely marked. Besides the present species, Africa produces several others, some of which are even more rich and intense in the metallic hues of their plumage.

THE EASTERN BLACK CUCKOO.†

THE plumage of the male bird is black, with metallic lustre. The bill is yellow. The female is shining greenish-brown above, spotted with white; the tail-feathers banded with white; whitish beneath, transversely undulated with greenish-brown.

Another genus, the Trogons,‡ forming a group of richly-coloured birds, abound in South America, where they conceal themselves in the central solitudes of umbrageous forests, and, except during the breeding season, dwell insulated and alone. They will sit motionless for half a summer's day, often upon a withered branch, and if not concealed by some accidental intervening mass of foliage, they fall an easy prey to the keen-eyed hunter, who eagerly searches for birds not less remarkable for the delicacy of their flesh than the beauty of their plumage. During the morning and evening hours, Mr. Swainson informs us, they become more active; venturing at these times into the open parts of the forest, and taking a shady station, dart upon winged insects, particularly beetles. At other times they feed upon fruits, especially the rich purple berries of the different *Melastomæ*, "at which," he says, "they invariably dart, precisely as if they were insects capable of getting away." It has been remarked by the woodland hunters, that the skin of these birds is of such delicate texture as to be with difficulty preserved in a natural or complete condition. It is probable, for this reason, that in museums they exhibit a heavy, shapeless aspect, redeemed, it is true, by the gorgeous colours or metallic splendour of their plumage.

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* Cuculus auratus.

† Cuculus Orientalis: Linnæus. Eudynamys Orientalis.

‡ Trogonidæ couroucouis.

HEAD OF A TROGON.

The trogons* are described as solitary birds, extremely jealous of their freedom, never frequenting inhabited or open tracts, and delighting in the silence of deserts. The interior of the thickest forests is their chosen abode for the entire year. They are sometimes seen on the summit of trees, but in general they prefer the centre, where they remain a portion of the day without descending to the ground, or even to the lower branches. Here they lie in ambush for the insects which pass within reach, and seize them with address and dexterity. Their flight is lively, short, vertical, and undulating. Though they thus conceal themselves in the thick foliage, it is not through distrust, for when they are in an open space, they may be approached so nearly as to be struck with a stick. They are rarely heard to utter any cries, except during the season of reproduction, and then their voice is strong, sonorous, monotonous, and melancholy. They have many cries, from the sound of one of which their name is derived. All those whose habits are known nestle in the hollows of worm-eaten trees, which they enlarge with their bills, so as to form a comfortable and roomy residence. The number of eggs is from two to four, and the young are born totally naked, but their feathers begin to start two or three days after their birth. The occupation of the male during incubation consists in watching for the safety of his companion, bringing her food, and amusing her with a song, which, though we should call it insipid, is to her without doubt the expression of sensibility. Some of the couroucouis express the syllable *pio*, repeated many times in succession, with a powerful, yet plaintive tone. Their accent almost reminds one of the wailings of a child who has lost its way, and it is thus that they cry to each other amidst the silence of the forests. As soon as the young are able to provide for themselves, they separate from their parents to enjoy that solitude and isolation which appear to constitute the supreme happiness of the species. Their aliments are composed of larvæ, small worms, caterpillars, coleoptera, and berries, which they swallow entire. The male at various ages, the female, and the young, differ in their plumage, which has given rise to the institution of more species than are really in existence.

The remarkable plumage and shy habits of the trogons did not escape the observation of the ancient Mexicans, in whose mythology one of the species, at least (*Trogon paroninus*), was celebrated. Another species, the *Tzinitzcan* of the Mexicans (*Trogon curucci*, Linn.), was employed by them, according to Hernandez, in the fabrication of the figures and pictures (*imagines*) used on festivals, in war, and in their temples. They were probably kept in one of the two houses which formed the royal menagerie of ancient Mexico, one of these houses being appointed to birds which did not live by prey, the other to birds of prey, quadrupeds, and reptiles. Three hundred men, according to Cortes, were employed to take care of these birds, besides their physicians, who watched their diseases and applied timely remedies. Of the three hundred attendants, some procured their food, others distributed it, others took care of the eggs at the time of incubation; whilst others, at certain seasons, picked their plumage; for the king not only delighted in the sight of so many species, but was very careful of their feathers, for the sake of the famous mosaic images and pictures, as well as of the other works which were made of them.

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* Trogonidæ.

THE GOLDEN TROGON.*

The most magnificent of the genus is the bird thus named, a rare and remarkable species, of which neither delineation nor description can convey an adequate idea. The greater proportion of the

THE EASTERN BLACK_CUCKOO.

plumage is apparently composed of burnished gold. The head ornamented by a brilliant crest, the wing-coverts falling in flakes of golden-green over the deep purplish-black of the primary and secondary quill feathers, the rich carmine of the lower parts bestowing a warmth and depth of effect which no

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* Trogon (Calurus) resplendens.

Venetian painter ever equalled, and the long waving and highly metallic feathers of the tail-coverts, extending about three times the length of the whole body, present a combination of beauty almost unexampled in the feathered tribes. The first specimens seen in this country were brought, we believe, by Mr. Schenley, from Vera Paez, in Central America. They are very much sought after as head-gear by the Peruvian damsels.

Another group of the order now under consideration is constituted of the Malcohas. These feathered creatures appear, as yet, to be almost exclusively confined to India and the adjacent islands. The generic characters consist in the bill being stout, longer than the head, and generally curved at the base; and in the side of the head, for a large space round the eye, being destitute of feathers, and exhibiting a naked granulated skin. The wings are short; the tail is long and graduated.

THE RED-HEADED MALCOHA.*

THE island of Ceylon, so famous for its profuse vegetation, especially for its aromatic trees, and no less so for its animals of various kinds, among which the pearl-bearing oyster is peculiarly conspicuous, is the habitat of the Red-headed Malcoha. This bird is about sixteen inches in length; the general plumage above is shining greenish-black; the tail is tipped with white and very graduated; the under surface is white; the large naked space around the edges is orange-red, bordered along its under margin with a rim of white. It frequents the deep woods, and is said to live chiefly on fruits. But of its habits, as of those of the rest of the group, naturalists have at present much to learn.

THE PARTI-COLOURED BARBET.

THE PARTI-COLOURED BARBET.†

WE now come to another family,‡ which includes the barbets, the woodpeckers, and the wrynecks, birds of true scansorial habits, climbing about the trunks and larger branches of trees with great facility, and feeding chiefly on such insects as secrete themselves either in the crevices, beneath the bark, or in the soft wood of decayed trees.

The Barbets are distinguished by their large conical beak, which appears, as it were, swollen or puffed out at the sides of the base, and is bearded, from whence the name of these birds is derived. The beak has five tufts of bristles, directed forwards. One of these tufts is behind each nostril, one on either side of the lower mandible, and the fifth is under the symphysis.

Their short wings and heavy proportions do not admit of swift flight; and their prey consists of insects and young birds, which they surprise, and also of fruits. Their nests are generally built in the holes of trees.

The sub-genus *Bucco*, Cuvier, *Capito*, Vieillot, embraces the true barbets, which have the conical bill slightly compressed and a little elevated in the middle. Their plumage is, generally speaking, gay; and they are to be found both in Africa and Asia. During the breeding season, they go in pairs, but they congregate in small flocks during the remainder of the year. The buff-faced barbet§ affords an example of the true barbets. It may be observed in the British Museum; its native place is uncertain.

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* Phœnicophaus pyrrhocephalus.

† Bucco versicolor.

‡ Picidæ.

§ Bucco Lathami.

Of the Barbets, there is a sub-genus.† The great head, short tail, and large bill of these puff-birds, as they are called, give them, as Cuvier observes, an air of stupidity, which their melancholy and solitary habits do not lessen. They are said to feed entirely on insects. All the recorded species are American. Swainson obtained one of them from Southern Brazil.

THE SPOTTED-BELLIED TAMATIA.

This naturalist, who had good opportunities of observing these birds, gives the following interesting account of their habits:—"There is something very grotesque in the appearance of all the puff birds; and their habits in a state of nature are no less singular. They frequent open cultivated spots near habitations, always perching on the withered branches of a low tree, where they will sit nearly motionless for hours, unless, indeed, they descry some luckless insect passing near them, at which they immediately dart, returning again to the identical twig they had just left, and which they will sometimes frequent for months. At such times the disproportionate size of the head is rendered more conspicuous by the bird raising the feathers, so as to appear not unlike a puff-ball; hence the general name they have received from the English residents in Brazil, of which vast country all the species, I believe, are natives. When frightened, this form is suddenly changed by all the feathers lying quite flat. They are very confiding, and will often take their station within a few yards of the window. The two sexes are generally near each other, and often on the same tree."

The length of this species is about eight inches. Plumage black and white, except the belly and vent, which are tinged with buff.

These birds lead off gradually to the true woodpeckers, a group of birds full of interest, in whatever point of view they are examined, and particularly exhibiting those marks of design which illustrate the wonders of the Great Creator.

The Woodpeckers,‡ wherever they are found, are exactly adapted to the circumstances in which they are placed. The tarsi are short and strong, and the toes large and armed with short hooked claws, which pierce the surface of the bark, or catch the slightest inequalities. In addition to the advantages thus derived from the powers of the feet, no bird is more indebted to the structure of its tail than the woodpecker. This part is, in fact, an essential support, and even a propelling instrument, calculated to aid the bird as it climbs. It is composed of ten feathers, the central ones having the shafts long, elastic, slightly bent inwards, and gradually narrowing to a point, which projects beyond the web. Thus pressed against a tree, these points being driven inwards, and catching every projecting roughness, the tail acts as a springy support or prop.

Nor less perfectly adapted to its purposes of splitting and chipping trees, is the bill of the woodpecker. At its base it is strong and thick, narrowing as it proceeds, till it ends in a hard wedge-shaped tip, compressed at its sides. The tongue is equally admirable as a flexible probe: long and worm-like, it is capable, by a peculiar muscular apparatus, of being protruded to a great extent, and is armed at its tip with a series of short spines, directed backwards, in addition to which it is covered with a viscid saliva. This organ, endued with great latitude of motion, the bird inserts into the crevices of the bark, into the fissures it makes with its beak, or into any aperture, in search of insects and their larvæ, and withdraws it; the prey adhering to it by means of the saliva, and being prevented from rubbing off by the retroverted bristles which barb the tip.

It is not to be wondered at that America, so rich in deep forests, as it once must have been, and indeed is now where the axe of the woodman has not yet penetrated, should produce many specimens of woodpeckers. Lawson thus enumerates those in Carolina known to him:—

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* Tamatia maculata.

† Tamatia: Cuvier.

‡ Picidæ.

"Of woodpeckers we have four sorts. The first is as big as a pigeon, being of a dark brown colour, with a white cross on his back, his eyes circled with white, and on his head stands a tuft of beautiful scarlet feathers. His cry is heard a long way; and he flies from one rotten tree to another, to get grubs, which is the food he lives on.

"The second sort are of an olive colour striped with yellow. They eat worms as well as grubs, and are about the bigness of those in Europe.

"The third is the same bigness as the last; he is pied with black and white, has a crimson head without a topping, and is a plague to the corn and fruit, especially the apples. He opens the covering of the young corn so that the rain gets in and rots it.

"The fourth sort of these woodpeckers is a black and white speckled or mottled; the finest I ever saw. The cock has a red crown; he is not near so big as the others; grubs, corn, and other creeping insects are his food. He is not very wild, but will let one come up to him; then shifts on the other side of the tree from your sight, and so dodges you for a long time together. He is about the size of an English lark."

Catesby notices the same species as Lawson, and adds others; some of which, in connection with the woodpeckers of other lands, we shall now proceed particularly to notice.

THE GREEN WOODPECKER.

THE GREEN WOODPECKER.*

This bird, generally observed either climbing the bark of trees in search of insects, or passing by a short and undulating flight from one tree to another, is found throughout the greater portion of the wooded districts both of England and Scotland. It bears various names: thus the people of Surrey and Sussex call it the yaffle or yaffil, from its repeated notes, which are compared to the sound of a laugh; in Northumberland it is styled rain-fowl, from its being more loud and noisy before a shower; while other terms, which are modifications of its name, as, woodwall, woodpic, and woodnacker, are in use in the New Forest, in Hampshire.

The Green Woodpecker obtains its food both upon trees and on the ground; its flight is short, undulating, and rather laborious. "When seen moving upon a tree," says Mr. Yarrell, "the bird is mostly ascending in a direction more or less oblique, and is believed to be incapable of descending, unless this action is performed backwards. On flying to a tree to make a new search, the bird settles low down on the bole or body of the tree, but a few feet above the ground, and generally below the lowest large branch, as if to have all its work above it, and proceeds from thence upwards, alternately tapping, to induce any hidden insect to change its place, pecking holes in a decayed branch, that it may be able to reach any insects that are lodged within, or protruding its long, extensible tongue to take up any insect on the surface; but the summit of the tree once obtained, the bird does not descend over the examined part, but flies off to another tree, or to another part of the same tree, to re-commence its search lower down nearer the ground."

A very large proportion of the food of this species is derived from ants and their eggs. Every person who has lived in the country must frequently have seen this gay-coloured woodpecker feeding at some ant-hill. Mr. Yarrell states that he has seldom had an opportunity of examining a recently killed specimen, the beak of which did not indicate, by the earth adhering to the base and to the feathers about the nostrils, that the bird had been so at work. Bechstein says that, in the winter, it will take bees from the hive, and that in the house it is fed on nuts, ants' eggs, and meat. Of its manners in captivity the German ornithologist states that the beauty of its plumage is all that can be said of it, for it is so fierce, quick, and stubborn, that it can only be kept chained. It is curious, he adds, to see it crack nuts.

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* Picus viridis.

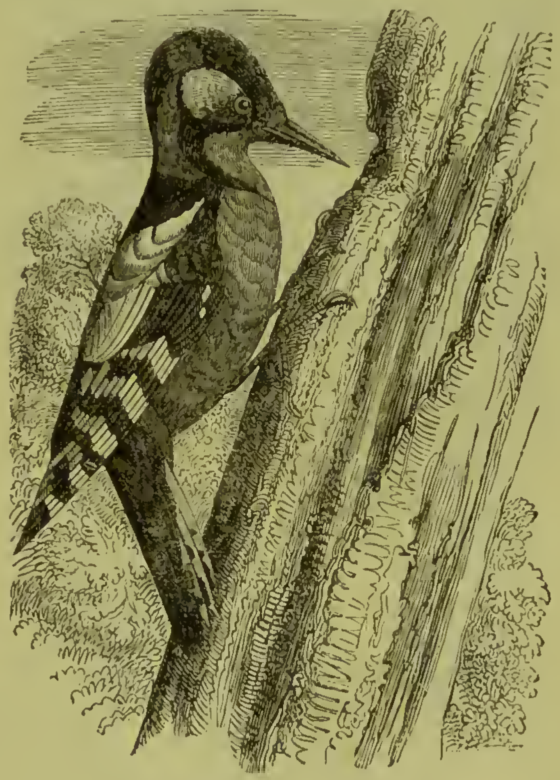
THE GREATER SPOTTED WOODPECKER.*

According to the editor of "Pennant's British Zoology," this species puts the point of the bill into a crack or the limb of a large tree, and makes a quick tremulous motion with its head, thereby occasioning a sound as if the tree was splitting, which alarms the insects, and induces them to quit their recesses. This action it repeats during the spring in the same spot, every minute or two for half an hour, and the bird will then fly to another tree, generally fixing itself near the top, for the same purpose.

The noise thus made, the writer says, may be distinctly heard for half a mile; and he remarks that the bird will also keep its head in very quick motion while moving about the tree for food, jarring the bark, and shading it at the same time it is seeking for insects. Bechstein says that the food of this species consists of insects, beech-mast, acorns, nuts, and the seed of pines and firs, and that, in order to crack nuts, it fixes them in the clefts of the trees.

The eggs, which are glossy white, and from four to six in number, are deposited at the bottom of the hole in a tree upon the decayed wood. On one occasion it was with difficulty the bird was made to quit her eggs; for notwithstanding a chisel and mallet were used to enlarge the hole, she did not attempt to fly out till the hand was intruded, when she quitted the tree at another opening. This species more frequently makes that jarring noise for which the woodpeckers are distinguished than any of the others, especially when disturbed from the nest.

Mr. Gould says they are sometimes observed to alight upon rails, old posts, and decayed pollards, where, among the moss and other vegetable matter, they find a plentiful harvest of spiders, ants, and other insects; nor are they free from the charge of committing great havoc among cherries, plums, and wall-fruit in general.



THE GREATER SPOTTED WOODPECKER.

THE LESSER SPOTTED WOODPECKER.†

Woods, orchards, nursery gardens, and well-timbered parks are the haunts of this pretty little bird. "In England," says Mr. Gould, "it is far more abundant than is generally supposed; we have seldom sought for it in vain wherever large trees, particularly the elm, grow in sufficient numbers to invite its abode: its security from sight is to be attributed more to its habit of frequenting the topmost branches than to its rarity. Near London it is very common, and may be seen by an attentive observer in Kensington Gardens, and in any of the parks of the neighbourhood. Like many other birds whose habits are of an arboreal character, the Lesser Spotted Woodpecker appears to perform a certain daily round, traversing a given extent of district, and returning to the same spot whence it began its route. Besides the elm, to which it is especially partial, it not unfrequently visits orchard trees of large growth, running over their moss-grown branches in quest of the larvæ of insects, which abound in such situations. In its actions it is very lively and alert. Unlike the large woodpecker, which prefers the trunks of trees, it naturally frequents the smaller and more elevated branches, which it traverses with the utmost ease and celerity. Should it perceive itself noticed it becomes shy, and retires from observation by concealing itself behind the branch on which it rests; if, however, earnestly engaged in the extraction of its food, its attention appears to be so absorbed that it will allow itself to be closely approached without suspending its operations. When spring approaches, it becomes clamorous and noisy, its call being an oft-repeated note, so closely resembling that of the wry-neck as to be scarcely distinguishable from it. At other times of the year it is mute, and its presence is only betrayed by the reiterated strokes which it makes against the bark of trees."

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* Picus major.

† Picus medius.

THE LESSER SPOTTED WOODPECKER.

THE GREAT BLACK WOODPECKER.*

Mr. Gould thus describes the habits of the Great Black Woodpecker:—"We need hardly say that it is on the bark of trees more exclusively that the woodpecker finds its food, and to this end are its powers and organs adapted. If we examine the toes of the present species, which are to be taken as illustrative of form in the whole of the family (with the exception of a single limited group), we find them long and powerful, furnished with strong claws, admirably adapted for grasping or clinging to the rough inequalities of the bark: besides this they are placed in pairs, so as in some measure to antagonise, but not, as generally stated, two before and two behind, for one pair is lateral, and diverges from the other at an acute angle, so as to be applied to the convexity of the tree, and thus render the grasp firm and close. The tail is composed of stiff feathers, the shafts of which taper gradually from the base of the extremities, which, curving inward when pressed against a tree, not only form a fulcrum for the support of the body, but, by their elasticity, aid the progress of the bird. This provision, the more needed from the posterior situation of the legs, is admirably calculated for ascending; and having explored the bark by a spiral course, the woodpecker flies off to the next tree to repeat the same process. The flight of the present species is undulating, seldom protracted to any extent, but limited to a transit from tree to tree, in the seclusion of its native woods. Its food consists of the larvæ of wasps, bees, and other insects; in addition, however, it devours fruits, berries, and nuts with avidity. The female selects the hollows of old trees, in which she deposits two or three eggs of a snowy whiteness."

Mr. Hewitson saw this species in two instances only in Norway, and at a distance. The birds were so wild that to approach them was impossible. The same observing ornithologist says, that on the wing the black woodpecker looks like a crow, and that its note resembles a loud hoarse laugh.

Mr. Yarrell, in his interesting work on "British Birds," states, that the great black woodpecker was added to the catalogue of the birds of Britain by Dr. Latham, who said that he had been informed that the species had occasionally been seen in Devonshire and the southern parts of the kingdom. Mr. Yarrell refers also to Dr. Pulteney's catalogue of the Dorsetshire birds, where the great black woodpecker is noticed as having been more than once killed in that county—one, in particular, is said to have been shot in a nursery at Blandford, and another at Whitechurch; and he then quotes Montagu's supplement for the following passage, which to every one who is aware of the great ornithological knowledge of the Earl of Derby, will be conclusive:—"Lord Stanley assures us that he shot a *Picus martius* in Lancashire; and we have heard that another was shot, in the winter of 1805, on the trunk of a tree in Battersea Fields." Mr. Yarrell then goes on to state that the specimen of the black woodpecker, formerly in the collection of Mr. Donovan (who was well known to give very high prices for rare British-killed birds, for his own use in his "History of British Ornithology"), was affirmed to have been shot in this country; and at the sale of Mr. Donovan's collection this specimen was purchased by the Earl of Derby. Mr. Yarrell further states that he had been told of two instances of the black woodpecker having been killed in Yorkshire, and that it is also recorded to have been killed in Lincolnshire. "A few years since," says Mr. Yarrell in continuation, "a communication was made to the Zoological Society of London, that two examples of the great black woodpecker had been at that time killed in a small wood, near Scale Inn, in Norfolk; and, still more recently, a pair were frequently seen in a small preserved wood near Christchurch, in Hampshire. It was hoped that they would have remained to go to nest; but the birds, disturbed by being too frequently watched, left the wood. Lastly, I may add, that Sir Robert Sibbald, in his *Scotia Illustrata*, claims *Picus martius* as a bird of Scotland, including it in his *Historia Animalium in Scotia*."

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* Picus martius.

Willoughby does not declare that this bird is not found in England. He procured his specimen in the market at Ratisbon, in Germany, and it was killed in the neighbourhood of that city; but touching its absence in England, he only says, "It is not found in England that *we know of*." Lewin figures the species in his "Birds of Great Britain," and writes thus:—"We believe this one to be exceedingly scarce in England; but as we have sufficient authority to say that it has been met with more than once in the southern and western parts of this kingdom, it may not be amiss to figure it among the British species." That the bird has occurred in this country in a natural state, even of late years, no one, we apprehend, can doubt, after the perusal of the evidence above collected; and the probability is, that this fine species was comparatively abundant in the vast forests which formerly covered so great a portion of Britain, especially in the northern parts of the country.

THE GREAT BLACK WOODPECKER.

THE GOLDEN-WINGED WOODPECKER.*

"No sooner," says Audubon, "has spring called these birds to the pleasant duty of making love, than their voice, which, by the way, is not at all disagreeable to the ear of man, is heard from the tops of high decayed trees, proclaiming with delight the opening of the welcome season. Their note at this period is merriment itself, as it imitates a prolonged and jovial laugh, heard at a considerable distance. Several males pursue a female, reach her, and, to prove the force and truth of their love, bow their heads, spread their tails, and move sideways, backwards, and forwards, performing such antics as might induce any one witnessing them, if not of a morose temper, to join his laugh to theirs. The female flies to another tree, where she is instantly followed by one, two, or even half a dozen of these gay suitors, and where again the same ceremonials are gone through. No fighting occurs, no jealousies exist among these beaux, until a marked preference is shown to some individual, when the rejected proceed in search of another female. In this manner all the Golden-winged Woodpeckers are soon happily mated. Each pair immediately proceed to excavate the trunk of a tree, and finish a hole in it sufficient to contain themselves and their young. They both work with great industry and apparent pleasure. Should the male, for instance, be employed, the female is close to him, and congratulates him on the removal of every chip which his bill sends through the air. While he rests, he appears to be speaking to her on the most tender subjects, and when fatigued is at once assisted by her. In this manner, by the alternate exertions of each, the hole is dug and finished. They caress each other on the branches, climb about and around the tree with apparent delight, rattle with their bill against the tops of the dead branches, chase all their cousins, the red-heads, defy the purple-grakles to enter their nest, feed plentifully on beetles and larvæ, cackling at intervals, and ere two weeks have elapsed the female lays either four or six eggs, the whiteness or transparency of which are, doubtless, the delight of her heart.

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* Colaptus auratus.

"If to raise a numerous progeny may contribute to happiness, these woodpeckers may be happy enough, for they have two broods each season. Even in confinement, the golden-winged woodpecker never suffers his naturally lively spirit to droop. It feeds well, and by way of amusement will contrive to destroy as much furniture in a day as can well be mended by a different kind of workman in two. Therefore, kind reader, do not any longer believe that woodpeckers—I mean those of America—are such stupid, forlorn, dejected, and unprovided-for beings as they have hitherto been represented." Another bird of the same country is of remarkable interest; it is the largest white-bill woodpecker of Catesby; and the largo log-cock and ivory-billed woodpecker of the Anglo-Americans.

THE IVORY-BILLED WOODPECKER.

The broad extent of this bird's dark and glossy plumage, with the well-defined snowy markings of the neck and wings, relieved by the rich tracery of the carmine crest and brilliant yellow eye, in some way so reminded the enthusiastic Audubon of the noble productions of a great Flemish painter, that whenever he saw one of these gorgeous birds flying from tree to tree, he would exclaim, "There goes a Vandyke!" The Ivory-billed Woodpecker confines its rambles to a comparatively small portion of the United States, and is never observed in the middle portions of the Union, where the nature of the wood does not appear to suit its habits. "Descending the Ohio," says M. Audubon, "we meet with this splendid bird for the first time near the confluence of that beautiful river and the Mississippi; after which, following the windings of the latter, either downwards towards the sea, or upwards in the direction of the Missouri, we frequently observe it. On the Atlantic coast, North Carolina may be taken as the limits of its distribution, although now and then an individual of the species may be seen in Maryland. To the westward of the Mississippi it is found in all the dense forests bordering the streams which empty their waters into that majestic river from the declivities of the Rocky Mountains. The lower parts of the Carolinas, Georgia, Alabama, Louisiana, and Mississippi are, however, the most favourite resorts of this bird, and in these States it constantly resides, breeds, and passes a life of peaceful enjoyment, finding a profusion of food in all the deep, dark, and gloomy swamps dispersed throughout them.

"I wish, kind reader, it were in my power to present to your mind's eye the favourite resort of the ivory-billed woodpecker. Would that I could describe the extent of those deep morasses, overshadowed by millions of dark, gigantic cypresses, spreading their sturdy, moss-covered branches as if to admonish man to pause and reflect on the many difficulties which he must encounter should he persist in venturing farther into their almost inaccessible recesses, extending for miles before him, where he would be interrupted by huge projecting branches, here and there the mossy trunk of a fallen and decaying tree, and thousands of creeping and twining plants of numberless species! Would that I could represent to you the dangerous nature of the ground, its oozing, spongy, and miry disposition, although covered with a beautiful but treacherous carpeting, composed of the richest mosses, flags, and water-lilies, no sooner receiving the pressure of the foot than it yields, and endangers the very life of the adventurer; whilst here and there, as he approaches an opening, that proves merely a lake of black, muddy water, his ear is assailed by the dismal croaking of innumerable frogs, the hissing of serpents, or the bellowing of alligators! Would that I could give you an idea of the sultry, pestiferous atmosphere that nearly suffocates the intruder during the meridian heat of our dog-days in those gloomy and horrible swamps! But the attempt to picture these scenes would be vain; nothing short of ocular demonstration can impress any adequate idea of them.

"The flight of this bird is graceful in the extreme, although seldom prolonged to more than a few hundred yards at a time, unless when it has to cross a large river, which it does in deep undulations, opening its wings at first to their full extent, and nearly closing them to renew the propelling impulse. The transit from one tree to another, even should the distance be as much as a hundred yards, is performed by a single sweep, and the bird appears as if merely swinging itself from the top of the one tree to that of the other, forming an elegantly-curved line. At this moment all the beauty of the plumage is exhibited, and strikes the beholder with pleasure. It never utters any sound whilst on the wing, unless during the love season; but at all other times, no sooner has this bird alighted, than its remarkable voice is heard, at almost every leap which it makes, whilst ascending against the upper parts of the trunk of a tree, or its highest branches. Its notes are clear, loud, and yet rather plaintive. They are heard at a considerable distance, perhaps a mile, and resemble the false high note of a clarionet. They are usually repeated three times in succession, and may be represented by the monosyllable *pait, pait, pait.* These are heard so frequently as to induce me to say that the bird spends few minutes of the day without uttering them; and this circumstance leads to its destruction, which is aimed at, not because (as is supposed by some) this species is a destroyer of trees, but more because it is a beautiful

THE VARIED WOODPECKER.

bird, and its rich scalp, attached to the upper mandible, is used for an ornament for the war-dress of most of our Indians, or for the short pouch of our squatters and hunters, by all of whom the bird is shot merely for that purpose. Travellers of all nations are also fond of possessing the upper part of the head and the bill of the male; and I have frequently remarked, that on a steam-boat's reaching what we call a *wooding-place*, the strangers were very ready to pay a quarter of a dollar for two or three heads of this woodpecker. I have seen entire belts of Indian chiefs closely ornamented with the tufts and bills of this species, and have observed that a great value is frequently put upon them. The food of this species consists principally of beetles, larvæ, and large grubs. No sooner, however, are the grapes of our forests ripe than they are eaten by the ivory-billed woodpecker with the greatest avidity. I have seen this bird hang by its claws to the vines, in the position so often assumed by a titmouse, and, reaching downwards, help itself to a bunch of grapes with much apparent pleasure. Persimons are also sought for by them as soon as the fruit becomes quite mellow, as are hay-berries. The ivory-bill is never seen attacking the corn or the fruit of the orchards, although it is sometimes observed working upon and chipping off the bark from the belted trees of the newly-cleared plantations. It seldom comes near the ground, but prefers at all times the tops of the tallest trees. Should it, however, discover the half-standing broken shaft of a large dead and rotten tree, it attacks it in such a manner as nearly to demolish it in the course of a few days. I have seen the remains of some of these ancient monarchs of our forest so excavated, and that so singularly, that the tottering fragments of the front appeared to be merely supported by the great pile of chips by which its base was surrounded. The strength of this woodpecker is such, that I have seen it detach pieces of bark seven or eight inches in length at a single blow of its powerful bill, and by beginning at the top branch of a dead tree, tear off the bark to an extent of twenty or thirty feet in the course of a few hours, leaping downwards with its body in an upward position, tossing its head to the right and left, or leaning it against the bark to ascertain the precise spot where the grubs were concealed, and immediately after renewing its blows with fresh vigour, all the while sounding its loud notes as if highly delighted.

"When wounded and brought to the ground, the ivory-bill immediately makes for the nearest tree, and ascends it with great rapidity and perseverance, until it reaches the top branches, when it squats and hides, generally with great effect. Whilst ascending, it moves spirally round the tree, utters its loud *pait, pait, pait*, at almost every hop, but becomes silent the moment it reaches a place where it conceives itself secure. They sometimes cling to the bark with their claws so firmly as to remain cramped to the spot for several hours after death. When taken by the hand, which is rather a hazardous undertaking, they strike with great violence, and inflict very severe wounds with their bill, as well as claws, which are extremely sharp and strong. On such occasions this bird utters a mournful and very piteous cry."

Nuttall states that this bird is a constant resident in the countries where it is found, in the warmer regions breeding in the rainy season, and that the pair are believed to be united for life. "More vagrant," says Nuttall, in continuation, "and independent than the rest of his family, he is never found in the precincts of cultivated tracts; the scene of his dominion is the lonely forest, amidst trees of the greatest magnitude. His reiterated trumpeting note, somewhat similar to the high tones of the clarionet (*pait, pait, pait, pait*), is heard soon after day and until a late morning hour, echoing loudly from the recesses of the dark cypress swamps, where he dwells in domestic security, without showing any impertinent or unnecessary desire to quit his native solitary abodes. Upon the giant trunk and moss-grown arms of this colossus of the forest, and amidst inaccessible and almost ruinous piles of mouldering logs, the high, rattling clarion, and repeated strokes of this princely woodpecker are often the only sounds which vibrate through, and communicate an air of life to, these dismal wilds. His stridulous interrupted call and loud industrious blows may often be heard for more than half a mile, and become audible at various distances, as the elevated mechanic raises or depresses his voice, or as he flags or exerts himself at his laborious employment. His retiring habits, loud notes, and singular occupation, amidst scenes so savage, yet majestic, afford withal a peculiar scene of solemn grandeur, on which the mind dwells for a moment with sublime contemplation, convinced that there is no scene in Nature devoid of harmonious consistence. Nor is the performance of this industrious hermit less remarkable than the peals of his sonorous voice, or the loud choppings of his powerful bill. He is soon surrounded with striking monuments of his industry; like a real carpenter (a nick-name given him by the Spaniards), he is seen surrounded with cart-loads of chips and broad flakes of bark, which rapidly accumulate round the roots of the tall pine and cypress where he has been a few hours employed; the work of half a dozen men, felling trees for a whole morning, would scarcely exceed the pile he has produced in quest of a single breakfast upon these insect larvæ, which have already, perhaps, succeeded in deadening the tree preparatory to the repast. Many thousand acres of pine-trees in the Southern States have been destroyed in a single season by the insidious attacks of insects, which, in the dormant state, are not larger than a grain of rice. It is in quest of these enemies of the most imposing part of the vegetable creation that the industrious and indefatigable woodpecker exercises his peculiar labour. In the sound and healthy tree he finds nothing which serves him for food." Another remarkable bird of America is the Varied Woodpecker.

THE LARGER RED-CRESTED WOODPECKER.*

THESE birds are not unfrequent in the well-timbered forests, from Mexico to Canada, at least to the fiftieth degree north. They are resident all the year in the interior of the fur countries up to the sixty-second or sixty-third parallels; rarely appearing near Hudson's Bay, but numerous in the gloomiest recesses of the forests that skirt the Rocky Mountains, in all the United States, particularly in the Gennesee country, in the state of New York.

Catesby says that these birds (besides insects which they get from rotten trees, their usual food) are destructive to "maize" by pecking holes through the husks that inclose the grain, and letting in the wet. Sir John Richardson states that the stillness of the primeval shades which this woodpecker frequents is often invaded by the strokes of its powerful bill, which excels the woodman's axe in the loudness of its sound, and still more in the rapidity with which its blows are urged; "nor does it," he adds, "fall far short in the quantity of chips it produces. Like other woodpeckers, he is extremely industrious, seemingly never a moment idle, flying from tree to tree, and plying his head like a hammer the instant that he alights." A few strokes of the bill suffice to indicate the state of the tree; and Sir John concludes his observations on this species by remarking, that if the bird judges that he would explore the interior in vain, he instantly quits that tree for another.

From the tall trees which cast their giant arms over all the uncleared river lands may often be heard his loud, echoing, and incessant cackle, as he flies restlessly from tree to tree, presaging the approach of rainy weather. These notes resemble *ekerek rek rek rek, rek, rek, rek*, uttered in a loud cadence, which gradually rises and falls. The marks of his industry are also abundantly visible on the decaying trees, which he probes and chisels with great dexterity, chipping off wide flakes of loosened bark, to come at the burrowing insects which chiefly compose his food. In whatever engaged, haste and wildness seem to govern all his motions, and by flying from place to place as soon as observed, he continues to escape every appearance of danger. Even in the event of a fatal wound, he still struggles with unconquerable resolution to maintain his grasp on the trunk, to which he trusts for his safety, to the very instant of death. When caught by a disabling wound, he still holds his ground against a tree, and strikes with bitterness the hand which attempts to grasp him, and, resolute for his native liberty, rarely submits to live in confinement. Nuttall states that this species is, without much foundation, charged at times with tasting maize; but in winter he observes the bird in South Carolina occasionally making a hearty repast on holly and similar berries.

The female lays about six snow-white eggs, in the cavity of a tree. Two broods are said to be produced in a season.

THE WRYNECK.†

THE Greeks were acquainted with this bird.‡ Aristotle has well described it, its long tongue, its power of protruding and retracting it, and the writhing, snake-like motion which it can impart to its neck without moving the rest of the body. It was also the Iynx of the Romans. It bears various names in England, as Long-tongue, Emmet-hunter, Snake-bird, Cuckoo's Mate, Cuckoo's Maid, and Cuckoo Fool (the two last common in Gloucestershire); in Wales it is called Gwas y Gôg and Gwddfro; the countries of Europe assign to it various appellations; and among the Japanese it is the Arizui.

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* Catesby. The Pileated Woodpecker of Pennant, &c.

† Yunx torquilla.

‡ Ἴυγξ.

The male has the ground-colour of the plumage of the upper parts rusty-ash colour, irregularly spotted and speckled with brown and black; a large brown streak extends from the occiput to between the scapulars; on the external barbs of the wing-feathers are rusty squared spots; the tail-feathers are bounded with black zig-zags; and the throat and front of the neck are pale rusty, with small transverse black lines.

When the note of the cuckoo is heard, the Wryneck may be looked for; coming and departing, too, about the same time. The latter, when found in its retreat in the hole of a tree, makes a loud hissing, sets up its crest, and writhing its head and neck towards each shoulder with grotesque contortions (whence its name, Snake-bird), becomes an object of terror to a timid intruder, when the bird, taking advantage of a moment of indecision, darts with the rapidity of lightning from a situation whence escape seemed impossible.

Caterpillars and a variety of insects form the food of the wryneck, and it is a great devourer of ants and their eggs. Elder-berries have been mentioned as being a part of its diet.

THE WRYNECK.

Mr. Yarrell thus describes the construction of the tongue and its appendages in this species:—"By an elongation of the two posterior branches of the bones of the tongue, and the exercise of the muscles attached to them, this bird is able to extend the tongue a very considerable distance beyond the point of the beak; the end of the tongue is horny and hard; a large and long gland is situated at the under edge of the lower jaw on each side, which secretes a glutinous mucus, and transfers it to the inside of the mouth by a slender duct. With this glutinous mucus the end of the tongue is always covered, for the especial purpose of conveying food into the mouth by contact. So unerring is the aim by which the tongue is darted out, and so certain the effect of the adhesive moisture, that the bird never fails in attaining its object at every attempt. So rapid, also, is the action of the tongue, in thus conveying food into the mouth, that the eye is unable distinctly to follow it."

Colonel Montagu says:—"We were enabled to examine the manners of this bird minutely, by taking a female from the nest, and confining her in a cage for some days. A quantity of mould, with emmets and their eggs, was given it; and it was curious to observe the tongue darted forward and retracted with such velocity, and with such unerring aim, that it never returned without an ant or an egg adhering to it, not transfixed by the horny point, as some have imagined, but retained by a peculiar tenacious moisture by nature provided for that purpose. While it is feeding the body is motionless, the head only is turned to every side, and the motion of the tongue is so rapid that an ant's egg, which is of a light colour, and more conspicuous than the tongue, has somewhat the appearance of moving towards the mouth by attraction, as a needle flies to a magnet. The bill is rarely used except to remove the mould in order to get more readily at these insects: where the earth is hollow the tongue is thrust into all the cavities to rouse the ants; for this purpose the horny appendage is extremely serviceable as a guide to the tongue. We have seen the green woodpecker take its food in a similar manner."

The smooth, shining white eggs—from six to ten in number—are generally deposited in a hole of a tree or the decayed wood. The birds are remarkable for local attachment, as the following anecdote, related by Mr. Salmon, will prove:—"I wished," writes that gentleman, "last spring to obtain the eggs of a wryneck to place in my cabinet, and, accordingly, watched very closely a pair that had resorted to a garden for the purpose of incubation: I soon ascertained that they had selected a hole in an old decayed apple-tree for that purpose, the entrance of which was so small as not to admit my hand. The tree being hollow and decayed at the bottom, near the ground, I was enabled to reach the nest by putting my arm upwards, and I found, on withdrawing the nest, that the underneath part of it was composed of moss, hair, &c., having every appearance of an old nest of the redstart of the preceding summer, which I suspect was the case: the upper part was made of dried roots. The nest did not contain any eggs, and I returned it by thrusting it up in the inside of the tree. On passing by the same tree about a week afterwards, my attention was arrested by observing one or two birds leaving the hole, upon which I gently withdrew the nest, and was much gratified at finding it contained five most beautiful glossy eggs, the shells of which were perfectly white, and so transparent that the yolks shone through, giving them a delicate pink colour, but which is lost in the blowing. I replaced the nest, and visited it during the ensuing week, and was induced, out of curiosity, to examine it again, when, to my astonishment, I found the birds had not deserted the hole, she having laid six more eggs since. I took these away, and was obliged to keep them, as I was only able to replace the nest by again thrusting it up in the inside of the tree as before, which I did. I again visited the spot in the following week, and found that they had still pertinaciously adhered to their domicile, having further laid four more eggs. I repeated the experiment, but not having an opportunity of visiting the tree until ten days afterwards, I thought at the time that the nest was abandoned, and was not undeceived until I had again withdrawn the nest, having taken the precaution of endeavouring to frighten the old bird off, should she be on the nest, which I found was the case; she suffered me to pull the nest to the bottom of the tree before she attempted to escape: there were seven eggs, which were slightly sat upon. What appears to me extraordinary is, that the bird should suffer her nest to be disturbed five times, and the eggs (amounting altogether to twenty-two) to be taken away at four different periods within the month, before she finally abandoned the spot she had selected."

Colonel Montagu says that the wryneck makes a noise very like the smaller species of hawks, frequently repeating it in spring. Mr. Yarrell describes the note as a sharp sound, repeated several times, and not unlike the whistle of a kestrel.

In captivity the wryneck is a favourite; and the bird soon becomes reconciled to the half-reclaimed state in which English and French boys are fond of keeping it, taking it out to the woods with a long string tied to its leg, and suffering it to ascend trees and forage for food generally, within the length of its tether, and letting it climb at intervals about their dress.

Another family of the order now under consideration is that of Parrots.*

The birds of this genus possess, in an eminent degree, the character of the order in which they are placed. They are climbers in the fullest sense of the word. Their toes, constantly four in number, are opposed two to two, and armed with solid and crooked claws—less so, however, than the claws of birds of prey. The two anterior toes are united at their base by a small membrane; the hinder are completely separated. The tarsi, in the majority of species, are very short, but in some they are elongated in a proportion nearly equal to that of the insessores in general. Their skin is scaly, as is that of the toes; the wings are usually shut; the tail is more or less long, and assumes a variety of forms; the colours of the plumage are almost always brilliant.

In the majority of this family, we find a plumage which, for richness and variety of colour, yields to few of the feathered race; and though, like the tulip among flowers, it may be thought gaudy, and composed of colours too violently and abruptly contrasted to give that satisfaction to the eye which a more chastened, or rather less abrupt, intermixture of tints is wont to produce, still we think no one can examine or look at some of the gorgeously-decked maccaws, the splendid and effulgent lories, or the diversified tints of the Australian parakeets, without acknowledging them to be among the most beautiful and striking of the feathered race.

The upper mandible, which is immovable in mammals, has more or less motion in birds. Some birds, indeed—for instance the capercailzie and rhinoceros birds—are not gifted with this motion; but mobility of the upper mandible is the rule in this class, and the want of it the exception. In the parrots this power is highly developed; for the upper mandible is not connected into one piece with the skull, by yielding and elastic bony plates, as is the case with birds in general, but constitutes a particular bone, distinct from the rest of the cranium, and articulated to it.

* Psittacidæ.

The advantages derived to the animal from this conformation are obvious to any one who watches a parrot taking its food, or using its bill as a third extremity to assist it in climbing about its cage. In most birds there is a progressive increase in the number of joints of the toes; thus the great toe has three, the next three, the middle toe four, and the outer toe five. The parrots possess a peculiar cross-bone belonging to the great toe. In common with the pigeon and some other birds, they are destitute of a gall-bladder. Their intestines are long, and without cæca. The soft, thick tongue, so characteristic of this tribe, must be a highly sensitive organ of taste. It is covered with papillæ, and moistened with a salivary secretion, so that the parrots are able to select and to taste different articles of food. In some of the forms,* the birds feeding on the nectar of flowers, the brush-like tongue is fringed with tubular processes, in conformity with their suctorial mode of feeding. One of them, kept by Mr. Caley, on seeing the coloured drawing of a plant, made an attempt to suck the flowers, and showed the same disposition towards a piece of cotton furniture. The accurate observer last mentioned supplied a species† of the same genus with honey and moistened sugar, which it sucked with ease and apparent pleasure, by means of its brush-like tongue. In the museum of the College of Surgeons there is one of these tubular tongues. The tongue is short, thick, and fleshy, as it is in most of the parrot tribe; but it is further distinguished as terminating in a number of very delicate and close-set filaments, which can be protruded and expanded like a brush.

The eyes of the parrots are moderately large, and situated laterally. The upper and lower lids form a rounded orifice, edged with small tubercles supporting the lashes in its entire circumference. The upper is evidently mobile; the third lid, or nictitating membrane, is very small, and the parrots are never seen to make use of it. The pupil is round, and not situated exactly at the centre of the iris, but more inward; so that the iris is a little broader at its external than its internal side. The colour of this last varies according to the species, but it is generally remarked to grow deeper with increasing age. A peculiar character of the parrots is the ability of contracting the pupil, more or less, independently of the action of the light, when they turn their attention to any object, when they feel any fear or anger, or even when they are in a sportive mood. These birds are evidently diurnal.

The large, hard, and solid bill, rounded throughout, and surrounded at its base with a membrane wherein the nostrils are pierced, together with the thick, fleshy, and rounded tongue, gives the parrots, as Cuvier observes, the greatest facility in imitating the human voice—a facility to which the complicated lower larynx, with its three peculiar muscles on each side, contributes. Their strong mandibles, formed for shelling and cracking the hardest fruits, are worked by more numerous muscles than those of other birds.

In certain birds of this genus,‡ the cheeks are naked of feathers, and covered with a white farinaceous powder, as is remarked in the maccaws. The circumference round the eye in others is more or less divested of feathers, and also covered with a white sort of farina. This appears to be an epidemic production, and is very abundant on other parts of the skin of these birds, whose plumage, when they shake it, gives out a considerable quantity of white dust. The quantity of mealy dust discharged from the skin by the cockatoos, and other species of parrots, particularly at pairing time, is remarkable; though the separation of this peculiar matter from the skin is not confined to this family, but is effected by many birds of different orders—eagles and herons, for instance. The cockatoos and others have the head ornamented with long and slender plumes, which can be elevated in the form of a tuft or crest, according to the inclination of the bird, but which, in general, are inclined along the neck. The neck is usually but of moderate length, sometimes it is even short, and tolerably thick; still, when the parrots wish to reach an object without changing their place, they are able to elongate the neck to a certain extent.

The body varies in size and elegance according to the species. In the parrots proper, it seems thicker than in the others, which, perhaps, is only the effect produced by the shortness and the strength and solidity of the tibia, toes, and tarsi. Some long-tailed parakeets, on the contrary, are distinguished by the fineness of their form and the elegance of their proportions. The breast of these birds is usually broad and rounded.

The wings are short, and their point rarely exceeds one-half the length of the tail, even in species

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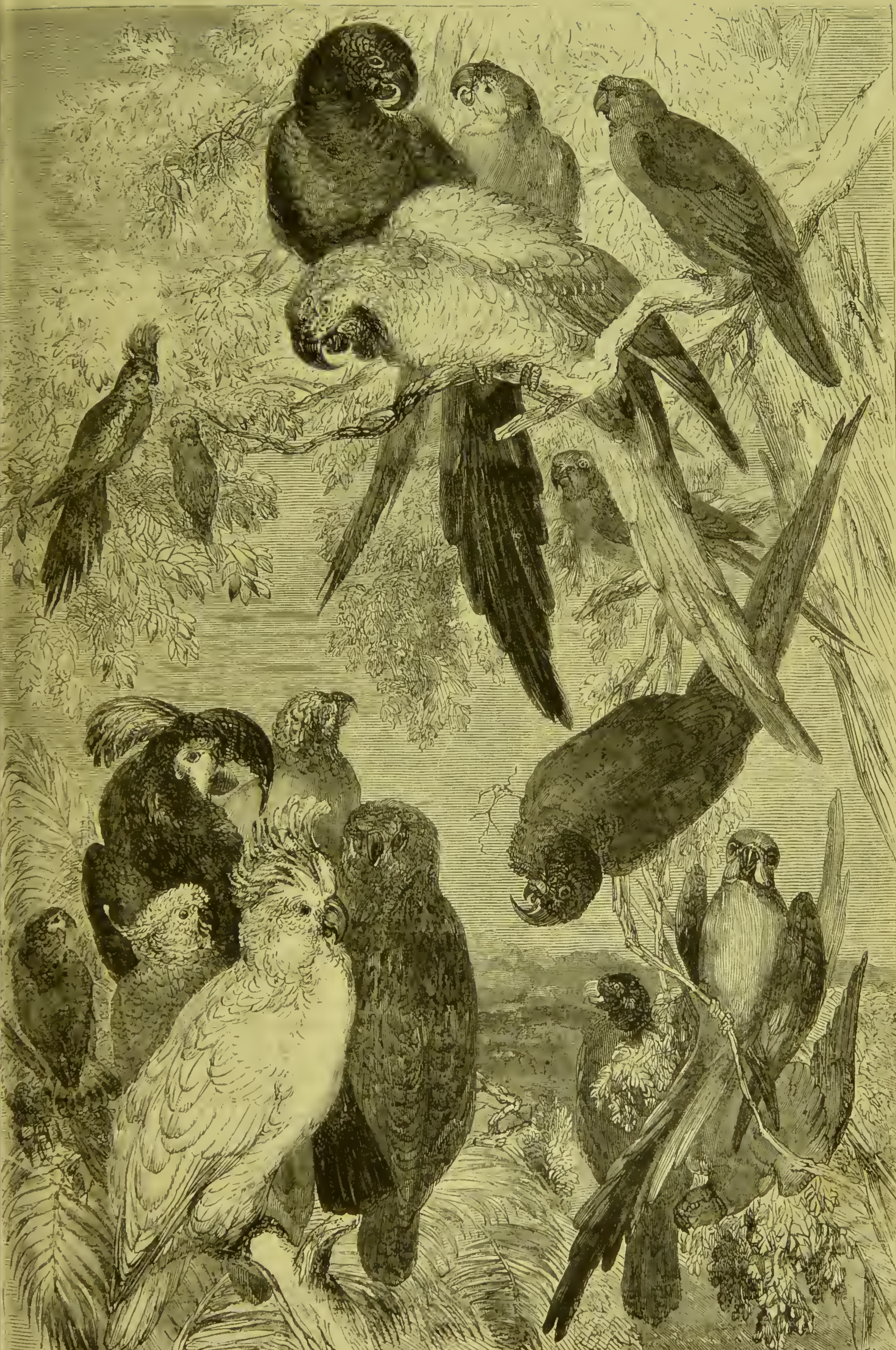
* Trichoglossi.

† Psittacus pusillus: Latham.

‡ Lorius domicella: Vigors.

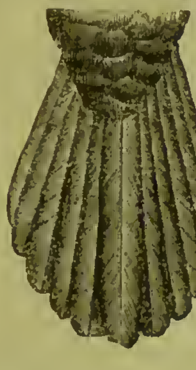


PARROTS.

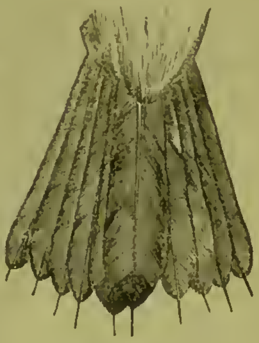
in which the tail is shortest. The first three remiges are the largest of all, and pretty nearly equal with each other.

There are differences in the tail as to the greater and less extent of the various quills which compose it, and which are twelve in number. As to its total size, it is either shorter than, equal in length to, or larger than the body, comprising the head and neck. In form it is sometimes straight or squared, when all the quills are of equal length; sometimes round, sometimes graduated, and sometimes arrow or spear-headed. Sometimes it is peculiarly broad at the end; some species have the caudal quills sharp at their terminations; and sometimes the tail is very short, and at the same time graduated.

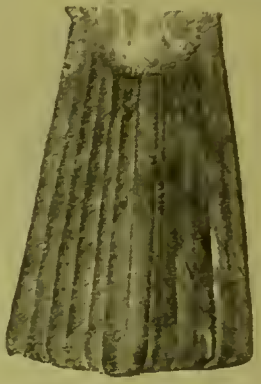
Though the feet of the parrots are robust, and the toes well adapted for climbing, there are to this some exceptions. In such instances, the birds remain constantly on the ground, where they walk with swiftness, which the other birds cannot do. The legs of parrots are usually feathered to the heel, but there are instances in which the body of the leg is bare. The colour of the feet is usually gray, but it is in some roseous, brown, or black.



TAIL OF THE MICROPSITTA PYGMÆA: LESSON.



TAIL OF LORIUS: BRISSON.



TAIL OF VAZA: LESSON

The colours of the plumage of the parrots are exceedingly varied, and almost always pure and brilliant. In this respect the adult females often differ from the males; while the young in their first or second livery, and even after the third moulting, present characters peculiar to themselves. Green is, in general, the predominating colour; then comes red, then blue, and finally yellow. This last colour appears among the parrots to be the general substitute for the white observed in other birds; and it is remarkable that in many of the species there are varieties uniformly yellow. Very often, when the feathers are plucked, red and yellow ones will shoot forth, whatever may have been the colour of the former. There are some species violet, purple, brown, or lilac-coloured. Some are known whose plumage is entirely gray; some have it black; and some, in fine, entirely white. The plumage of this extensive family is of the most rich and varied description, embracing almost every colour and gradation of tint. The Zoological Society of London possesses, most probably, the finest living collection of these birds in the world.

America, Brazil, and Guiana are the countries which contain the greatest number of species of parrots, all of them belonging to the division of parakeets; that of the parrots proper, and that of the psittaculi. The maccaws are exclusively confined to these countries. It does not appear that any birds of this genus are found on the chain of the Cordilleras; they are not very numerous even in Paraguay. Some species belong to the islands in the Gulf of Mexico; and it is not improbable that some may exist in the Floridas. On the other side of the Andes, from Chili to California, more appear to have been noticed; but many exist in Chili, on the shores of the Southern Ocean.

Many birds of this genus belong to the African continent, from Senegal as far as the forests which are near to the Cape of Good Hope. They are, however, fewer in number than those of India and America. The Barbary coasts, from Morocco as far as Egypt—that is, the entire chain of Atlas, and the northern reverse of that chain—are destitute of them. There are some in Madagascar, but none in the Canary Isles.

In Asia, parrots are found in Hindostan and its dependent islands, in Cochin China, in China, and in the eastern Archipelago. There the handsomest and largest species, and those most remarkable for their forms, are in abundance.

In Polynesia, this genus is considerably extended. Australia has species peculiar to itself. These birds are also numerous in New Zealand, the Macquarrie Islands, and in the groups of the Friendly and Society Islands. The lories are peculiar to the Philippines and New Guinea, and the psittaculi, with the tongue terminated by a pencil of cartilaginous filaments, belong to the countries which extend from New Holland to the Friendly Islands.

Europe, all the northern and central regions of Asia, the polar countries, Greenland, Iceland, the northern and temperate parts of America, Kerguelin's Land, and the South Shetlands are almost the only portions of the globe in which the family of the parrots has no representative.

As the wings of the parrots are generally short, and their bodies bulky, they have some difficulty in rising to a certain point of elevation; but that once attained, they fly very well, and often with much rapidity, and through a considerable extent of space. The majority confine themselves to lofty and thickly-tufted woods, frequently on the borders of cultivated lands, the productions of which they plunder and destroy. Their ordinary mode of flight is from one branch to another; and it frequently happens that they will not fly continuously, except when pursued. Many of them emigrate according to the season, and, in particular, the Carolina parrots. Such travel away for some hundreds of leagues, differing in this respect from the habits of others; but they are comparatively few in number. The difficulty of flight with many is the cause of their restriction within narrow limits, and their concentration in certain islands, while they are not found in others which closely border upon the former. This is peculiarly the case with many of the island groups of Polynesia.

The food of the parrots consists principally of the pulps of fruit, such as those of the banana, the coffee-tree, the palm, and the lemon. They are especially fond of almonds; generally they attack the pulp only to get at the kernel; this, when once seized, is fixed on the under wrinkled surface of the upper mandible; they turn it repeatedly until it is placed on the tongue in the proper direction for the introduction of the trenchant edge of the lower mandible; then the bird soon forcibly separates the valves of the almond-shell, and getting the almond into its bill, soon divides it, so that all its envelopes are rejected. The fragments are finally swallowed in succession. Some of this family are said to live on roots, and others to seek their aliment in herbs.

When domesticated, the parrots, maccaws, parakeets, and cockatoos show the same partiality for vegetable seeds, and are generally fed very well on hemp-seed, the skins or husks of which they detach with astonishing skill. Some that receive bones to gnaw acquire a very determined taste for animal substances, and especially for the tendons, ligaments, and other less succulent parts. From this kind of feeding, some parrots contract the habit of plucking out their own feathers, that they may suck the stems; and this becomes so urgent a want, that instances have been known of their stripping their bodies absolutely naked, not leaving a vestige of down wherever the bill could reach. They spared, however, the quills of the wings and tail, the plucking out of which would have caused them too much pain. M. Desmarest states that the body of one of these birds, belonging to M. Latreille, thus became as naked as a pullet plucked for roasting. Yet this bird supported the rigour of two very severe winters without the slightest alteration of health and appetite. M. Vieillot observes that this habit of deplumation is produced, in many parrots, by an itching of the skin, and not in consequence of their being accustomed to eat animal substances.

The parrots drink little, but often, and do so raising up the head, but less strongly than in other birds. They all use, with great dexterity, one of their feet to carry their food to their bills, while they stand perched on the other. They sojourn much on the borders of streams and rivers, and in marshy places. They are fond of the water, and seem to take the greatest delight in bathing themselves—an operation which they perform several times a day when in a natural state. When they have bathed they shake their plumage until the greater portion of the water is expelled, and then expose themselves to the sun until the feathers are completely dried. In captivity, and even during the most rigorous seasons, they seek to bathe, and at all events plunge the head repeatedly into water.

With the exception of the time of incubation, the parrots live in flocks, more or less numerous; go to sleep at the setting, and awake at the rising of the sun. In sleep, they turn the head upon the back. Their sleep is light, and they are not unfrequently heard to utter some cries during the night. In a state of domestication, after they go to rest is said to be the most suitable time for repeating to them such words as they are intended to learn, because they then experience no distraction.

Their life is very long, and the mean duration of it, among the parrots properly so called, is calculated at forty years. Instances have, however, been known of individuals who lived in a state of domestication for ninety or a hundred years, or even more. The parakeets live, generally, about five-and-twenty years. An effect of captivity, in some species, is, according to M. Vaillant, to change the colour of their plumage; and to this cause he attributes the frequent varieties observable among these birds.

The birds of this genus are monogamous. They make their nests in the trunks of rotten trees, or in the cavities of rocks; and compose them, in the first instance, of the *detritus*, or dust, of the worm-eaten wood, and of dry leaves in the second. The eggs are not numerous; usually only three or four each time; but there are broods several times in the year. The young, when born, are totally naked; and the head is so large, that the body seems to be merely an appendage to it. They remain some time without having sufficient strength to move it. They are subsequently covered with down, but are not completely invested with feathers for two or three months. They remain with their parents till after the first moulting, and then leave them for the purpose of pairing. The eggs are ovoid, short, as thick at one end as the other, and those which are known are of a white colour. Some of them are nearly equal in size to those of a pigeon.

HEAD OF MASCARINUS: LESSON.

HEAD OF PSITTACUS ACCIPITRINUS: GMELIN.

HEAD OF MACROCERCUS HYACINTHINUS: VIEILLOT.

It was for a long time supposed that the increase of these birds could take place only in their native country. Many parrots, however, were born in Europe so far back as 1740 and 1741. In 1801 some Amazon parrots were born at Rome. M. Lamouroux has given us considerable details respecting the broods of two blue maccaws that were at Caen some years ago. In four years and a half these birds laid sixty-two eggs in nineteen broods. Of this number, twenty-five eggs produced young ones, of which ten only died. The others lived, and became perfectly accustomed to the climate. They laid eggs at all seasons; and the broods became more frequent and more productive in the course of time, and in the end much fewer were lost.

HEAD OF ENICOGNATHUS LEPTORHYNCHUS: KING.

HEAD OF PSITTACULA PULLARIA: LESSON.

HEAD OF NESTOR OF NEW ZEALAND: LESSON.

The number of the eggs in the nest used to vary, six having been together at a time: and these maccaws were seen to bring up four young ones at once. These eggs took from twenty to twenty-five days to be hatched, like those of our common hens. Their form was that of a pear, a little flattened, and their length equal to that of a pigeon's egg. It was only between the fifteenth and five-and-twentieth day that the young ones became covered with a very thick down, soft, and of a whitish slaty-gray. The feathers did not begin to make their appearance until towards the thirtieth day, and took two months to acquire their full growth. It was twelve before the young arrived at the state of their parents, but their plumage had all its beauty from six months old. At three months old they abandoned the nest, and could eat alone; up to this period they had been fed by the father and mother, who disgorged the food from the bill in the same manner as the pigeons do.

It is probable that the success of this education was owing to the care which was taken in providing these birds with a suitable nest. This consisted of a small barrel, pierced towards a third of its height with a hole of about six inches in diameter, and the bottom of which contained a bed of sawdust three inches thick, on which the eggs were laid and hatched. Since the time now referred to, collared parakeets of Senegal, and Pavonian parrakeets, have been hatched in Paris, in hollows made in large billets of wood, where the parent birds had fixed their nests.

THE PARROT. FROM A PAINTING BY JAN STEEN.

Parrots, parrakeets, and other birds of the same family, which are imported into Europe, are generally taken young in the nest, and brought up in their native country. Some are taken adult; they are caught when inebriated by eating the seeds of the cotton-tree, which they are very subject to become; or they are brought down by arrows, which, having a button on the end, stun without killing them. M. D'Azara states that the natives of Paraguay take them in a manner which appears very singular, if not incredible. They attach one or two pieces of wood to a tree frequented by these birds for the sake of its fruit. They put a stick or two across from these pieces of wood as far as the tree, and construct with palm leaves a sort of cabin, sufficiently large to conceal the fowler. He has with him a tame parrot, which by its cries attracts the wild ones of the forest, and the last never fail to come at the voice of the prisoner. The hunter, without loss of time, passes round their necks a running knot, attached to the end of a long wand, which he moves from within his cabin. If he has five or six of these wands, he can take as many parrots, for they will not attempt to escape, unless the cord presses tightly on their necks.

All these birds are susceptible of education, but the young are more so than the old. The means employed consist in imposing certain punishments upon them, such as immersing them in very cold water, of which they are greatly afraid, or puffing at them with tobacco smoke. Rewards are also used, and when they perform what is desired, such things are given them as they prefer, more especially sugar and sweet wine. They are tamed and kept obedient by taking them with boldness, and speaking to them with authority, and in a loud tone of voice.

They may thus be taught to perform various gestures and assume different postures. Some will lie down on their backs, and rise only at the master's command; others will perform exercises with a stick, or dance in a manner more or less grotesque. They are taught by constantly repeating close to them such words as they are wished to learn. Success, however, does not always depend on such endeavours. Some species are better disposed than others for this kind of education, and the same is the case with different individuals of the same species.

In no case should the greatest attainments of these birds be ranked too highly. Their imitative powers do not themselves entitle them to any marked superiority over others, and still less to the possession of anything approaching to human intelligence. The imitation is nothing but an organic mimicry, depending, certainly, on the conformation of the voice, and, probably, on some peculiar aptitude of the ears. Nor should it be overlooked that the capacity of articulating words is not exclusively confined to this genus. Pies, jays, blackbirds, stares, and others, and even small birds, can imitate human speech, more or less, from organic facility, rather than the possession of any superior intelligence. The ear of such animals, though different from ours, has the power of delicately appreciating sounds. This faculty is observable among certain individuals of our own species, and it is scarcely necessary to remark, that neither that power, nor a facility of mimicking sounds in general, is always accompanied by a marked intellectual superiority. The reverse, indeed, is often strikingly remarkable.

It is admitted, however, that the parrots have a great superiority over birds in general in their relation to man. They attach themselves to those who tame them, display aversion to those who have ill-treated them, and that with marked discrimination. It has been said that the males attach themselves to women in preference to men, and exhibit much ill-temper towards the latter; while exactly the reverse takes place with the females. M. Vieillot declares the assertion to be well founded, and instances the case of a male ash-coloured parrot, in his own possession, which he never could approach without being provided with thick leather gloves; and yet the bird was perfectly obedient, in all respects, to Madame Vieillot, and exhibited the greatest fondness towards that lady; while, on the other hand, a female of the same species showed great attachment to the naturalist.

THE ASH-COLOURED, OR GRAY PARROT.*

THIS well-known species, though not conspicuous for the brilliancy and variety of plumage which distinguish the great majority of the tribe, is remarkable for its docility and mimicry, the faculty it possesses of imitating the human voice, as well as any other sound, its never-ceasing garrulity, and its clear and distinct articulation. In most of these particulars it surpasses the rest of its congeners, on which account it has always been held in high estimation by the bird-fancier and lover of living curiosities. This we learn from the large sums which have, at all times, been offered and paid for highly-gifted or well-taught individuals. Even as early as A.D. 1500, we read of a parrot at Rome, supposed to be of this species, for which one hundred pieces of gold were given by a cardinal, it having had, it is said, the power of repeating, with clearness and without hesitation, the whole of the Apostles' Creed.

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* Psittacus erythacus: Linnæus.

Parrots of singular powers are still to be met with. A friend of the writer's was in Edinburgh at the time of the great Peel demonstration, and in a morning call was shown into the drawing-room where a parrot was in its cage. Fond of animals, he went at once to the bird, who, looking very knowingly, instantly inquired, "What do you think of Sir Robert Peel, now?" Another, advanced in life, and with hair of a snowy whiteness, had the still more strange question put to him by a parrot in a room into which he was shown in the City-road, London, "Who kissed the cook?" But another bird, an ash-coloured or gray parrot, the property of a friend of the writer's, is exceedingly sagacious.

Unlike the birds which questioned a stranger at once, she has a strong aversion to visitors, refusing usually to speak in their presence, and always expressing, in her own way, her hatred or contempt. She is now about twelve years old, and for some days after her arrival did not utter a single word. Her first words were, "Pretty cockatoo," but she soon uttered others, until she became very loquacious, and is still picking up quickly all she hears.

As soon as her mistress comes down-stairs in the morning, the bird says, "Mother, how do you do? Good morning!" As breakfast is being prepared, she watches attentively every movement. Should that frequent domestic incident occur, she makes the house ring with, "The kettle boils! the kettle boils!" bustling about the cage with restless activity. Observing the cutting of a round of bread, she quietly says, "Polly likes a bit;" if asked, "What does Polly like?" the answer is, "Toast—just one little bit;" on receiving which, she adds, "Polly likes *two* bits." As soon as the milk is taken in, she calls, "Puss! puss!" it being the practice to give the cat some; but if the basin is about to be set down without her own portion being given, she calls, "Come! come! come!" until she is supplied and has drank of the milk very heartily. If the door bell is rung without being attended to, she raps loudly on her perch, and calls, "Mother! mother! Mrs. P—— ! Mrs. P—— !" the name of her mistress, nor does she stop until the bell is answered.

In the winter her cage is often hung in the kitchen, but in fine days of other seasons it is suspended from the ceiling of a lower front room, looking out on a much frequented country road. At the approach of harvest, Irish labourers pass by, seeking employment in the neighbourhood, and no sooner does the parrot observe one of them, than she cries out, "Hooroo, Pat, are you all right?" adding, perhaps, the singular question, "Does your mother like fish?" A strange gentleman passing the window one day, heard these sounds; he looked round, but could see no one; when, suddenly, he caught sight of the parrot, and saying, with a smile, "Oh, my lady, you are there, are you?" passed onwards. But so well known is the bird to the particular class in whom she takes so much interest, that twos, and threes, and even groups will stop before the window, express their concern if she is not there, and say, if they see her, "Aye, there she is," when she never fails to make her usual inquiries about themselves, and the piscivorous propensities of their respective mothers.

A visitor coming down in the morning before the rest, took up something that was lying on the mantelpiece, when instantly she heard the question, "Ho! what are *you* about?" and thinking it was the master of the house, for she knew nothing of the bird, she put down what she had displaced, with the feeling that, though unintentionally, she must have done wrong. As, however, the parrot sees a lady or gentleman preparing to leave the house, she courteously says, "Good bye; good bye." Her special regard is reserved for her mistress, whom she will allow, at any time, to play with her, but no such freedoms are granted to her master; she would even, if urged, peck out a piece of flesh from his finger. The writer saw him, one day, attempting to induce her to talk, but she knew a stranger was present, and so she only turned her head from side to side, played with the wires of her cage, and seemed to say by her cunning glances at him, now and then, "Don't you wish I may talk?—I know all you say is about me—but I have a will of my own, and I don't mean to say a word, I can tell you!"

This bird can vary her voice from that of an aged man to the cry of a child. When she supposes herself to be in danger, as one day when her cage tipped over, she called, "Mother! mother!" just like a child, until she was set right. For a little dog, named Peg, she was accustomed to whistle, and to call, "Peg! Peg!" but only for him to hear her say, "Ah! ah!—Get out with you!" To a green parrot, which was in the house for a time, she was thoroughly unkind, calling out, "Hold your noise! Get out;" and in consequence, the bird was given away. Whenever she is offended, she says, "I'll kick up a row;" and she keeps her word, the house forthwith resounding with her screams.

On behaving ill, she makes her *amende* with "Naughty Poll! naughty Poll!" but her tune is soon changed into "Pretty Poll! pretty Polly P——!"—the name of her mistress—"Polly is a great beauty!"

She imitates many sounds she hears, as those of lambs and sheep; whistles tunes, as "Buy a Broom," and "Charley over the Water," and sings nicely, one of her favourites being "The Vesper Bell," but passing rapidly from one to the other. At night, though she has not spoken for hours, she notices the preparation for retiring to rest, and says, "Good bye, good bye," till the light is gone.

A person named O'Kelly gave fifty guineas for a parrot at Bristol, and paid the expenses of the woman who brought it up to town. It is reported not only to have uttered what is usually termed "everything," but to have sang with great correctness a variety of tunes, and beat time as he sang; and if perchance he mistook a note in the tune, he returned to the bar wherein the mistake arose, and corrected himself, still beating the time with the utmost exactness. He sang, it is said, any tune desired, fully understanding the request made.

There is one, however, which is occasionally brought from Brighton to Hampton Court, that appears to equal it in intelligence and power of imitation. Mr. Jesse says:—"I have seen and heard so much of this bird, that I requested the sister of its owner to furnish me with some particulars respecting it, and I now give the account in her own agreeable manner of stating it. I will only add, that its accuracy need not be doubted.

"'As you wished me to write down whatever I could collect about my sister's wonderful parrot, I proceed to do so, only promising that I will tell you nothing but what I can vouch for having myself heard. Her laugh is quite extraordinary, and it is impossible not to help joining in it oneself, more especially when in the midst of it she cries out, "Don't make me laugh so; I shall die, I shall die;" and then continues laughing more violently than before. Her crying and sobbing are curious, and if you say, "Poor Poll, what is the matter?" she says, "So bad, so bad; got such a cold;" and after crying for some time, will gradually cease, and making a noise like drawing a long breath, say, "Better now," and begin to laugh.

"'The first time I ever heard her speak was one day when I was talking to the maid at the bottom of the stairs, and heard what I then considered to be a child call out, "Payne (the maid's name), I am not well, I am not well;" and on my saying, "What is the matter with that child?" she replied, "It is only the parrot; she always does so when I leave her alone, to make me come back;" and so it proved, for on her going into the room the parrot stopped, and then began laughing quite in a jeering way.

"'It is singular enough, that whenever she is affronted in any way she begins to cry, and when pleased, to laugh. If any one happens to cough or sneeze, she says, "What a bad cold." One day, when the children were playing with her, the maid came into the room, and on their repeating to her several times things which the parrot had said, Poll looked up and said quite plainly, "No, I didn't." Sometimes, when she is inclined to be mischievous, the maid threatens to beat her, and she often says, "No, you won't." She calls the cat very plainly, saying, "Puss, puss," and then answers, "*Mew*;" but the most amusing part is, that whenever I want to make her call it, and to that purpose say, "Puss, puss," myself, she always answers, "*Mew*," till I begin mewing; and then she begins calling "Puss" as quick as possible. She imitates every kind of noise, and barks so naturally that I have known her to set all the dogs on the parade at Hampton Court barking; and I dare say, if the truth was known, wondering what was barking at them; and the consternation I have seen her cause in a party of cocks and hens, by her crowing and chuckling, has been the most ludicrous thing possible. She sings just like a child, and I have more than once thought it was a human being; and it is most ludicrous to hear her make what one should call a false note, and then say, "Oh, la," and burst out laughing at herself, beginning again quite in another key. She is very fond of singing, "Buy a broom," which she says quite plainly; but in the same spirit as in calling the cat, if we say, with a view to make her repeat it, "Buy a broom," she always says, "Buy a *brush*," and then laughs as a child might do when mischievous. She often performs a kind of exercise which I do not know how to describe, except by saying, that it is like the lance exercise. She puts her claw behind her, first on one side and then on the other, then in front, and round over her head, and whilst doing so keeps saying, "Come on, come on;" and when finished, says, "Bravo, beautiful!" and draws herself up. Before I was as well acquainted with her as I am now, she would stare in my face, and then say, "How d'ye do, ma'am?" This she invariably does to strangers. One day I went into the room where she was, and said, to try her, "Poll, where is Payne gone?" and to my astonishment, and almost dismay, she said, "Down stairs." I cannot at this moment recollect anything more that I can vouch for myself, and I do not choose to trust to what I am told; but from what I have myself seen and heard, she has almost made me a believer in transmigration.'

"In addition to this account, I may mention, that the Rev. Dr. Hooker, of Rottingdean, near Brighton, has a parrot which evinces almost equal sagacity. If a piece of tape is given it, it weaves it into a sort of basket, and will tie a knot with its beak and foot."

The imitative propensity of the parrot, amusing as it in general may be, is, however, sometimes to be guarded against, from its being productive of untoward accidents, as the following instance will show. A parrot, which was kept upon a quay in a seaport town, had learned the term, with its appropriate enunciation, used by carters in backing—that is, making the horse, by a retrograde motion, place the cart or wagon in the most convenient station for loading or unloading. This term the bird one day made use of when a horse and cart had imprudently been left unattended for a short time, and the horse, obeying the mandate of the bird, continued to keep moving backwards till both were precipitated over the quay, and the unfortunate animal was drowned.

The gray parrot is a native of Western Africa, from whence it appears to have been imported at a very early period; but common and well known as it is in a state of captivity, with its peculiar habits and economy in a state of nature we are still but little and imperfectly acquainted. Like most of its kind, it is said to breed in the hollows of decayed trees; and the instinctive propensity for such situations does not appear to desert it even in a state of captivity, for Buffon mentions a pair in France that, for five or six years successively, produced and brought up their young, and that the place they selected for this purpose was a cask partly filled with sawdust. Its eggs are stated to be generally four in number, their colour white, and in size equal to those of a pigeon. In its native state, the food of this parrot consists of the kernels of various fruits, and the seeds of other vegetables; but when domesticated or kept caged, its principal diet is generally milk and bread, varied with nuts, almonds, &c., and even pieces of dressed meat. When feeding, it often holds the food clasped in the foot, and before swallowing, masticates or reduces it to small pieces by its powerful bill and palatial cutters. This member, so unlike that of other frugivorous birds, is admirably calculated for the principal offices it has to perform, in breaking the shells of the hardest fruit and seeds, and as a strong and powerful organ of prehension and support; for few of our readers but must have observed that the bill is always first used, and chiefly depended upon, when a parrot is caged, in climbing or moving from one position to another.

The longevity of the feathered race, we believe, in general far exceeds what is commonly supposed; at least, if we may judge from the age attained by various birds, even when subjected to captivity and confinement. Thus, we have instances of eagles living for half a century; the same of ravens, geese, and other large birds, as well as among the smaller kinds usually kept caged. The gray parrot, like many others of its tribe, often lives to a great age, and we are told of individuals attaining to fifty, sixty, or even a hundred years. According to Le Vaillant, one which lived in the family of Mr. Meninck Huyser, at Amsterdam, for thirty-two years, had previously passed forty-one with that gentleman's uncle, who bequeathed it to his nephew; and there can be no doubt it must have been at least two or three years old at the time of its arrival in Europe. When Le Vaillant saw it, the bird was in a state of entire decrepitude, and in a kind of lethargic condition, its sight and memory being both gone, and it was fed at intervals with biscuits soaked in Madeira wine. In the time of its youth and vigour, it had been distinguished for its colloquial powers and distinct enunciation, and was of so docile and obedient a disposition, as to fetch its master's slippers when required, as well as to call the servants. At the age of sixty its memory began to fail, and instead of acquiring any new phrase, it began to lose those it had before attained, and to intermix in a discordant manner the words of its former language. It moulted regularly every year till the age of sixty-five, when this process grew irregular, and the tail became yellow, after which no further change of plumage took place. The gray parrot is subject to variety, as shown in the figure of Edwards, where the ground colour is mixed with red. It measures about twelve inches in length. The bill is black, strong, and much hooked, and the orbits and space between them and the eyes covered with a naked and white skin. The whole of the plumage, with the exception of the tail, which is of a bright deep scarlet, is of an ash-gray colour, deepest upon the back, and the feathers finely relieved and margined with paler gray. The irides are of a yellowish white; the feet and toes are gray, tinged with flesh-red.

The intelligence of the parrot has often, we conceive, been greatly exaggerated. It is certainly true that these birds exhibit the most perfect brain which is found among the feathered race. But the parrot's imitation seems purely mechanical; it articulates words indeed, but this cannot be regarded as a true language. In the same manner that an air is taught to a linnet with a bird-organ, so are words taught to a parrot, and he repeats them without knowing wherefore. He does not understand their meaning, and though he may repeat them on certain occasions, because he has learned them, he sees no reason for doing so, like man. He utters indifferently an entreaty or an insult, and those involuntary substitutions which really prove his want of intelligence pass, with unreflecting persons, for wit, or some other mental quality, of which the bird is totally destitute, and which, in fact, it has no ability to acquire.

THE INDIAN PARROT.

THE INDIAN PARROT.

The birds distinguished by Vaillant as the parrots with a trunk, have characters sufficiently peculiar by which they may be detached from others.

Their short and square tail, and crest composed of long and narrow feathers, assimilate them to the cockatoos. They have the cheeks naked, like the aras; but their bill with an enormous upper mandible, and the lower very short, which cannot, therefore, be entirely closed; their cylindrical tongue, terminated by a little concave gland cleft at the end, and capable of being protruded out of the mouth; their legs naked a little above the talons; their tarsi short and flat, on which they frequently support themselves in walking, distinguish them from all other parrots.

THE GREAT SCARLET MACCAW.*

Another genus is formed of the gorgeous Maccaws.† The face is either naked, or merely striped with feathery lines. The tail is very long, wedge-shaped, and sharp-pointed. These birds, the largest and most magnificent of the parrot tribe, inhabit South America. The Great Scarlet Maccaw, when in perfect plumage, sometimes measures about three feet in length, the tail, of course, included. The prevailing plumage is scarlet, as its name implies, the wings blue, the wing-coverts varied with yellow, the cheeks white and wrinkled. It is, certainly, a very sumptuous creature, but, after all, rather too like a richly-liveried footman—an association somewhat strengthened by its being so often seen as an inhabitant of lordly mansions, and surrounded by other menial bipeds, almost as gorgeous as itself. Our feelings would no doubt have been different had we ever witnessed their natural evolutions. "It is a grand sight in ornithology," says Waterton, "to see thousands of aras flying over your heads, low enough to let you have a full view of their flowing mantle." How delightful would it have been, on some bright and dewy morning, to have accompanied Lord Anson to view a magnificent rapid in the island of Quibo. A fine river of transparent water there precipitates itself along a rocky channel, forming numerous falls, and the great disrupted rocks which form its boundary on either side are crowned with lofty forest trees. "While the commodore and those who were with him," he says, "were attentively viewing the place, and were remarking the different blending of the waters, the rocks, and the woods, there came in sight, as it were still more to heighten and animate the prospect, a prodigious flight of maccaws, which, hovering over the spot, and often whirling and playing on the wing about it, afforded a most brilliant appearance by the glittering of the sun upon their varied plumage; so that some of the spectators could not refrain from a kind of transport when they recounted the complicated beauties which occurred at this extraordinary waterfall." The blue and yellow species* is little inferior to the preceding, either in size or sumptuousness. It is less common, and seems to have been first described by Aldrovandus, from a specimen which he saw in the palace of the Duke of Mantua. It is said to be also less easily reclaimed as a domestic bird; yet, says a naturalist, "We have not seldom enjoyed the society of a very fine example which makes its way familiarly (such is its custom in the afternoon) amid the varied horticultural produce which graces the *dessert* of Mr. Neill." Many other splendid species are described and figured in the works of naturalists.

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* Psittacus aracanga: Latham.

† Macrocercus: Vieillot.

THE GREAT SCARLET MACCAW.

THE BLUE AND YELLOW MACCAW.†

This beautiful species is rather inferior in size to the great scarlet maccaw. In length, it measures about thirty-nine inches, the tail alone being about twenty-four. The bill is entirely black, very large and strong; the upper mandible measuring, from the forehead to the tip, three inches and a quarter: it is greatly deflected, and bends immediately from the base; the upper mandible is short and massive; rapidly ascending, and describing when closed a right angle with the upper. The cheeks are white and nearly naked, with three fine narrow striæ of small black plumes beneath the eyes. The irides are yellowish white. Immediately beneath the under mandible is a broad black band, extending upwards to the ears, and encompassing the greater part of the naked white space. The whole of the upper plumage is of a beautiful rich blue, passing into green upon the forehead, crown, rump, and some of the smaller wing-coverts. The greater quills and tail are of a deeper tint, approaching to violet. The under surfaces of the wings and tail are yellow. The sides of the neck, breast, and inferior parts of the body are rich saffron yellow. The legs and feet are blackish-gray, the scales defined by whitish lines.

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* Psittacus ararauna: Linnæus.

† Macrocercus ararauna.

Like all the other members of the genus, it is a native of tropical America, and is met with in the Brazils, particularly upon the banks of the river Amazon, in Guiana, and Surinam. It prefers the woods, particularly such as occupy swampy grounds, and which abound in a species of palm, upon whose fruit it principally subsists. It is said generally to keep in pairs, though occasionally to assemble in large flocks, and when this is the case, their united screams are heard to a great distance. The dimensions and form of their wings and long cuneiform tail indicate a powerful and vigorous flight, and, accordingly, we are informed that in this respect they are inferior to none of the tribe; they fly often at a high elevation, and accompanied by a variety of aerial evolutions, particularly before alighting, which is always upon the summits of the highest trees. They deposit their eggs, which never exceed two in number, in the hollow trunks of decayed trees, and generally have two broods in the year. Both sexes are reported to sit alternately upon the eggs, and to be equally assiduous in cherishing and conveying food to the young. When taken at an early age, they are easily tamed, but their imitative powers are not equal to those of the gray parrot, and it is seldom that they can be taught to articulate clearly, or more than a few words. Their natural notes are very unpleasant to the ear, consisting of loud and piercing screams, interrupted with hoarse, croaking murmurs. Living specimens of this species are sometimes seen caged in England. A very fine one was recently completely domesticated at Dr. Neill's, Canonmills, near Edinburgh, and allowed the freedom of several apartments: when desirous of being noticed, it called out "Robert," the name of its earliest master, very distinctly; but it did not acquire more than one other conventional sound.

THE ROSE-CRESTED COCKATOO.*

THE Cockatoos are natives of Australia and the Indian islands, inhabiting the woods, and feeding upon seeds and soft stony fruits, which last their powerful bill enables them to break with ease. Like others of their congeners, they make their nests in decayed trees, and are easily tamed when taken at an early age. They become familiar, and even attached, but their imitative powers seldom go beyond a few words added to their own cry of "Cockatoo."

In the depth of their bills, the strength and curvature of the upper mandible, and the disproportionate shortness and thickness of the lower, the cockatoos vie with the more gorgeous maccaws, which they also emulate in size, habits, and behaviour. The naked space in their cheeks is, however, reduced to a small circle surrounding each of the eyes; and their tail is short, and perfectly square at the extremity.

Their most remarkable character consists in a tuft of elongated feathers, rising from the back of the head, and capable of being raised or depressed at pleasure. By this crest they are at once distinguished from all the other groups of the parrot family, with the exception of a New Holland genus, differing from the other cockatoos in the greater elevation and comparative shortness of its bill, the increased dilatation of its lower mandible, and several other characters of inferior moment. In the latter group, the ground colour of nearly all the species is black; while in the common cockatoos, it is almost uniformly white.

The species of this genus naturally arrange themselves into two sub-divisions; in the one of which the crest assumes a rounded form, and falls backward over the neck; while in the other it is lengthened into a point, folded together, and curved upwards. The Rose-crested species belongs to the first subdivision. Its length is sixteen or eighteen inches; and its plumage white, with an occasional tinge of rose. The crest is formed of feathers for the most part of a bright orange-red beneath, and the inferior wing and tail coverts have a shade of yellow. The bill is bluish-black, and the legs are of a leaden gray.

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* Plyctolophus rosaceus: Vieillot.

The Rose-crested Cockatoo is a native of Sumatra and the Moluccas. It is said to be less intelligent than the rest of the group, and is particularly fond of making a noise and assuming a variety of antic postures.

COCKATOOS AND PARROTS.

THE GREATER SULPHUR-CRESTED COCKATOO.*

We give this bird as an example of the second division of the genus *Plyctolophus*, or that in which the feathers are folded on themselves, curved upwards, and elongated into a sharp point. The ground of its plumage is purely white, with a tinge of light yellow on the crest, the inner barbs of the wing and lateral tail-feathers, and the inferior tail-coverts. The iris is dusky brown, and the bill and legs grayish-black. In size, the bird is somewhat less than the species last described, but the longer feathers of the crest measure as much as seven inches in length. Mr. Caley says :—"I have met with this bird in large flocks at the conflux of the Grose and Haukesberg rivers, and in the long meadow near the

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* Plyctolophus galeritus : Vieillot.

Nepean river in New Holland. They are shy, and not easily approached. I have heard from the natives that this bird makes its nest, in the rotten limbs of trees, of nothing more than the vegetable mould formed by the decayed parts of the bough; that it has no more than two young ones at a time; and that the eggs are white without spots."

THE LESSER SULPHUR-CRESTED COCKATOO.*

This species we frequently see in confinement; for though rarely able to articulate more than a few words, its handsome appearance, docile disposition, and amusing habits, render it a great favourite with those who delight in feathered pets. It is kind and affectionate to those it is accustomed to see, and who feed and take care of it; but suspicious of strangers, whose caresses it rarely admits of with impunity. When alarmed or irritated, it erects the crest to the fullest extent, making a peculiar noise; at other times it is kept depressed, and hanging over the nape of the neck.

The general plumage of the body is white, slightly tinted upon the breast, sides, and inner wing-coverts with pale sulphur-yellow. The crest, in form like that of the other species, and auricular spot, are fine sulphur-yellow. The legs and toes are gray, the irides red. It is a native of the Moluccas and other Indian islands; but of its natural habits we have again to report deficiency of information. In captivity the female sometimes produces eggs; "and," says Mr. Selby, "we have now specimens by us, which were laid by one at rather peculiar periods, viz., the 21st of June, 21st of September, and 21st of December; but whether this resulted from the peculiar economy of the bird, as acted upon by the seasons, or was the effect of the confinement, we are unable to determine."

Our able and eloquent naturalist, Professor T. R. Jones, describes himself as, some years ago, strolling into the parrot-house in the Gardens of the Zoological Society, as he thought, very quietly and inoffensively, and certainly without the remotest idea of giving umbrage to any of its pretty feathered occupants, when, to his great surprise, his entrance seemed to be the signal for a wild and general disturbance.

"The sound of the tocsin," he says, "could not have roused an insurrection more uproarious than that produced by the appearance of our (pardon us, gentle reader, if we flatter ourselves) by no means repulsive physiognomy; dire was the screaming, fierce the gesticulation of every scansorial biped among them. Parrots, macaws, and cockatoos seemed equally indignant at our intrusion; and such a clamour as they raised, such a whirlwind of discordant sounds, would certainly have done credit to Babel. Overwhelmed with noise, deafened with the terrible cacophony, we beat a retreat, and right gladly escaped into the quiet glades of the gardens.

"On our return, after the lapse of an hour or so, finding that all was tranquil within, we again entered the parrot-house, and again were greeted with a concert, beating marrow-bones and cleavers, and all rough music imaginable.

"Wondering what could be the cause of a reception so uncourteous, where before we had always been a welcome visitor, we approached an old favourite cockatoo, and, reproachfully holding up a little walking-cane before her face, began to expostulate with her on such behaviour. We could scarcely have imagined the picture of rage and terror that the bird presented: with crest erected to the uttermost, staring eyes, and limbs trembling all over, she retreated to the extreme limits of her chain, and struck with her wings at my cane, as if fighting for very life; and so indeed she was, or thought she was, for, on my attention being thus directed to my little cane, I appreciated at once the cause of her fury: the head of the walking-stick was carved in imitation of that of a serpent, with brilliant eyes, and a most grim and threatening aspect. The supposed appearance of so terrible a foe amongst their peaceful party had, by an instinct true and natural, roused them to self-defence, affording at once a proof of the carver's skill who had so ornamented my rattan, and an illustration of instinctive horror of a very interesting character."

Another genus† has the bill rather thick, the culmen of the upper mandible rounded, the lower broad and short. The middle feathers of the tail are greatly lengthened. The most anciently known of the parrot race belong to this genus, such as the Alexandrine parrakeet and other long-tailed species, distinguished by their elegance of form, their ruby-coloured bills, their semi-circled necks, and the rich verdure of their plumage. The one just named is a native of India and Ceylon, and derives its designation from the fact, real or supposed, of its having been first transported from Asiatic countries by Alexander the Great. Its most distinguishing characters consist in the broad black patch which occupies the fore-part of the throat, and extends laterally in two narrow processes on each side of the neck; a black line stretches from the base of the beak to the eyes, and there is a deep purplish-red patch at the base of the wings. Its bill is larger than that of the rose-coloured parrakeet,* which however, it greatly resembles in its general aspect.

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* Cacatua cristata: Vieillot.

† Palæornis: Vigors.

The last-named species is widely spread over India, and as far eastward as Manilla. It appears, indeed, to be identical with another species extremely abundant on the African coasts, and well known in France under the title of *perruche de Senegal*. In so far as any conclusions can be drawn from the vague and brief descriptions handed down by ancient writers, it would appear that this species was, as it still continues to be, more frequent in the days of antiquity than any of its congeners. No allusion is made by these authors to those specific marks by which the Alexandrine parrakeet is so clearly distinguished, and the general description applies very closely to the rose-necked kind. That the latter was extensively known, and held in high esteem on account of the brilliancy of its plumage, the docility of its manners, and its successful imitative powers, is proved by innumerable passages in the classical

THE CRESTED COCKATOO.

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* Ps. torquatus.

writers of antiquity, more especially from the earliest times of the Roman empire to a very late period of its annals.

The Alexandrine parrot is generally supposed to have been brought to Europe from the island of Ceylon, the ancient Taprobane. In the reign of Nero, the Romans introduced other species from different quarters of Africa. They were highly prized by that luxurious people, who lodged them in superb cages of silver, ivory, and tortoiseshell; and the price of a parrot in those days frequently exceeded that of a slave. Nor did Ovid think it beneath him to write a lengthened elegy on the death of Corinna's favourite, a bird which, in the love it bore its mistress, seems to have emulated that of the dying Greek for his country;

> "Clamavit moriens lingua, Corinna, vale."
> Its dying tongue cried, "Corinna, farewell."

"I have seen," says Mr. Layard, "at Chilan, such vast flights of parrakeets coming to roost in the cocoa-nut trees which overhang the bazaar, that their noise drowned the Babel of tongues bargaining for the evening provisions. Hearing of the swarms which resorted to this spot, I posted myself on a bridge some half mile distant, and attempted to count the flocks which came from a single direction to the eastward. About four o'clock in the afternoon, straggling parties began to wend towards home, and in the course of half an hour the current fairly set in. But I soon found that I had no longer distinct flocks to count; it became one living, screaming stream. Some flew high in the air till right above their homes, and dived abruptly downward with many evolutions, till on a level with the trees; others kept along the ground and dashed close by my face with the rapidity of thought, their brilliant plumage shining with an exquisite lustre in the sun-light. I waited on the spot till the evening closed, when I could hear, though no longer distinguish, the birds fighting for their perches: and on firing a shot they rose with a noise like the 'rushing of a mighty wind,' but soon settled again, and such a din commenced as I shall never forget: the shrill screams of the birds, the fluttering of their innumerable wings, and the rustling of the leaves of the palm-trees, was almost deafening, and I was glad at last to escapo to the Government Rest House."

THE BLUE-BELLIED PARRAKEET.*

THIS beautiful and richly-varied species inhabits the Molucca Islands. Its tongue, in common with that of several New Holland parrakeets, is finely ciliated at the tip on either side. Vaillant, during his residence at the Cape, had an opportunity of studying the manners of a pair of these birds, which had been imported from Amboyna. They bred during their confinement in the menagerie of M. Van Bletemberg, then Governor of the Cape. The female deplumed her beautiful breast, and, after having collected the feathers into a heap, deposited two round white eggs, on which she sat most assiduously—the male feeding her at intervals, by disinterestedly disgorging what he had swallowed, and presenting the same to his spouse. The young were produced at the end of nineteen days, and, in the space of a few more, became covered with a gray cinereous down, which was, by degrees, succeeded by green feathers on the body, and by blue ones on the head. At the end of three weeks they left the nest, and perched upon the neighbouring sticks, where the male and female fed them in concert, as above described, after the manner of pigeons. The parent birds continued to attend them in this manner for six months, and often afforded a very interesting scene—the young being frequently seated beyond the female, and the male, not being able to reach them, first presented the food to his mate, who immediately delivered it to her young. These, though of different sexes, were perfectly alike till the first moulting, at which time red feathers, bordered with green, began to appear on the breast, and the male became distinguished by the blue patch upon the abdomen.

THE CAROLINA PARRAKEET.†

THE great body of the *Psittacidæ*, as already observed, are natives of the intertropical climates; but the species now under consideration is one of the few that occurs in the temperate regions of the northern hemisphere. It is a native of the North American Continent, inhabiting the United States to a latitude as high as 42°. Such, at least, was the case some twenty or twenty-five years ago, when Alexander

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* Psittacara cyanogaster; Shaw.

† Arara Carolinensis.

Wilson was engaged in tracing out the history of the birds inhabiting the States; for we find, on turning to his delightful pages, that then it not only prevailed throughout Louisiana and the shores of the Mississippi and Ohio, but also those of their tributary waters as high as Lake Michigan, in latitude 42° N. We learn, however, from Audubon—not less graphic or original in his descriptive powers—that of late years these birds have rapidly diminished in number, and that they are now almost banished from districts where formerly they used to abound. "At that period," he says—speaking of five-and-twenty years ago—"they could be procured as far up the tributary waters of the Ohio as the great Kenhawa, the Scioto, the heads of the Miami, the mouth of the Manimee at its junction with Lake Erie, on the Illinois river, and sometimes as far north-east as Lake Ontario, and along the eastern districts as far as the boundary line between Virginia and Maryland. At the present day few are to be found higher than Cincinnati; nor is it until you reach the mouth of the Ohio that parrakeets are met with in considerable numbers. I should think that along the Mississippi there is not now half the number that existed fifteen years ago."

The Carolina parrakeets in all their movements, which are uniformly gregarious, show a peculiar predilection for the alluvial, rich, and dark forests bordering the principal rivers and larger streams, in which the towering cypress and gigantic sycamore spread their vast summits, or stretch their innumerable arms over a wide waste of moving or stagnant waters. From these, the beech, and the hackberry, they derive an important supply of food. The flocks, moving in the manner of wild pigeons, dart in swift and airy phalanx through the green boughs of the forest; screaming in a general concert, they wheel in wide and descending circles round the tall button-wood, and all alight in the same instant, their green lustre, like the fairy mantle, rendering them nearly invisible beneath the shady branches, where they sit, perhaps arranging their plumage, and shuffling side by side, seem to caress and scratch each other's heads with all the fondness and unvarying friendship of affectionate doves.

Audubon, in his account of the Carolina parrakeets, says:—"Their flight is rapid, straight, and continued through the forests, or over fields and rivers, and is accompanied by inclinations of the body, which enable the observer to see alternately their upper and under parts. They deviate from a direct course only when impediments occur, such as trunks of trees or houses, in which case they glance aside in a very graceful manner, as much as may be necessary. A general cry is kept up by the party, and it is seldom that one of these birds is on the wing, for ever so short a space, without uttering its cry. On reaching a spot which affords a supply of food, instead of alighting at once, as many birds do, the parrakeets take a good survey of the neighbourhood, passing over it in circles of great extent, first above the trees, and then gradually lowering, until they almost touch the ground, when, suddenly re-ascending, they all settle on the tree that bears the fruit of which they are in quest, or on one close to the field in which they expect to regale themselves."

If the gun thin their ranks, they hover over the screaming, wounded, or dying, and returning and flying around the place where they miss their companions, in their sympathy seem to lose all idea of their impending danger. More fortunate in their excursions, they next proceed to gratify the calls of hunger, and descend to the banks of the river or the neighbouring fields, in quest of the inviting kernels of the cockle-burr,* and probably of the bitter-weed,† which they extract from their husks with great dexterity.

In the depth of winter, when other resources begin to fail, they, in common with some of the finches, assemble among the tall sycamores, and, hanging from the extreme twigs, in the most airy and graceful postures, scatter around them a cloud of down from the pendent balls, in quest of the seeds which now afford them an ample repast. Out of mere wantonness, they often frequent the orchards, and appear delighted with the fruitless frolic of plucking apples from the trees, and strewing them on the ground untasted. They are also fond of some sorts of berries, and particularly of mulberries, which they eat piecemeal, in their usual manner, as they hold them by the foot. Peculiarity of food appears wholly to influence the visits and residence of this bird, and in plain, champaign, or mountainous countries, they are wholly strangers, though common along the banks of the intermediate water-courses and lagoons.

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* Xanthium strumarium.

† Ambro ia, species.

THE PAVOUAN PARRAKEET.*

THIS species is a native of Cayenne and the Antilles, where it is not uncommon, often flying about in flocks, and frequenting the wooded savannahs. Its prevailing plumage is green; the cheeks and sides of the neck are speckled with bright red, which becomes more conspicuous as the bird advances in age; the smaller wing-coverts are bright red, the greater yellow, and both the quill and tail-feathers are dusky-yellow beneath; the bill is whitish, the legs and feet gray.

M. Gabriae has described a pair of these birds in their domestic state. Two cages were prepared for their reception in the month of April. They were placed contiguous, but communicating only by a small door; and the one enjoyed "the blessed light of day," while the other was kept covered, so that no light could enter but by the mutual door. The latter also contained an abundant supply of saw-dust. The birds were placed in the open apartment, which was the larger of the two, and they speedily showed symptoms of tender attachment to each other. They long declined, however, to enter the darkened dwelling, although the female put in her head, withdrew it again, advanced part of her body, then returned tail foremost; but, finally, after several days of hesitation, she entered the mysterious chamber. There she expressed her satisfaction by little kindly, cheerful cries, and often called in the male, who exhibited every proof of affection.

She soon began to scrape about and arrange a kind of nest, and, on the 18th of May, she laid her first egg, succeeded, at intervals of three days, by a second, third, and fourth; after which she sat assiduously. The male took no share in the hatching, but he kept constantly close by the nest, as if to cheer her sedentary hours. He did not, however, allow his affection to his wife to interfere with his duty towards his hoped-for family. If the female, who never left the nest but to solace herself with meat and drink, appeared to devote too much time to that indulgence, he remanded her back by a little blow with his beak, which occasionally produced something approaching to a quarrel. The young were first covered with a grayish down, and were cherished with the tenderest solicitude by the parents, who, on the approach of any threatened danger, defended them with the greatest courage. It was, in truth, a curious sight to see two creatures, before so kind and tenderly affectionate to those around them, so grateful for their food, and so solicitous of human kindness, changed, by this new passion, into little tigers, and so intractable as to attend no longer to fair hands or gentle voices. This natural wildness showed itself, also, strongly in the young ones, who recognised alone their parents, and bit and scratched at all the world besides.

THE PAPUAN LORY.†

ANOTHER sub-family of the *Psittacidæ* is that of the *Loriana*, so named from the beautiful scarlet-coloured Lories, natives of Continental India and its islands, and which appear to constitute one of its typical forms. A difference of structure is apparent in the shape of the bill and the tongue—the former member being weaker and slenderer in its proportions than in the other parrots, especially as regards the under mandible, which is lengthened and less convex in its contour, with the tip contracted and narrow, and the cutting edges straight, and without emargination. The tongue, also, is not so thick or fleshy, and the tip, instead of being smooth and soft, is rough, and, in some instances, furnished with a pencil of setaceous bristles. This structure is bestowed upon them for the purpose of extracting the nectar of flowers, and sucking the juices of tender fruits, which, it appears, constitute the principal support of the members of this beautiful division.

To great elegance of form this species unites a plumage of the richest description, the ground colour of the body being of a deep, but brilliant scarlet, relieved in parts with deep azure blue, yellow, and green. The tail, or at least the two narrow central feathers, greatly exceed the rest of the body in length, as they measure upwards of eleven inches, while the former does not exceed six; the lateral feathers are regularly graduated, as in the other lories, the longest measuring about four inches, or one-third the length of the two intermediate plumes. The bill is of an orange-red colour; the upper mandible is long, with the tip or hooked part projecting far beyond the under one, which is conic and narrow. The tongue is similar in structure and appearance to that of the other members of the group—the tip being furnished with delicate papillæ. Upon the vertex and nape are two irregular bars of azure, margined with purplish-black. The lower parts of the tibiæ, lower back, and rump, are also of a deep azure. Upon the sides of the breast and thighs are patches of rich yellow. The wings are green; the interior webs of the quills blackish. The elongated tail-feathers are pale grass-green, passing towards the tips into yellow; the lateral have their basal half dark green, the remainder deep saffron-yellow. This lovely specimen is an inhabitant of Papua, and other parts of New Guinea, and, as might be expected in countries rarely visited by the naturalist, little is known of its history or peculiar habits. Its remains, like those of the birds of paradise, frequently reach us in a mutilated state, being deprived of the legs, and often wanting the long feathers of the tail; and from such specimens have been derived the imperfect descriptions of various authors.

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* Psittacara Guianensis: Latham.

† Charmosyna Papuensis.

Passing now to birds of a somewhat different structure, we arrive at another family.* There are three species of Toucans in Demerara, and three diminutives, which Mr. Waterton calls "Toucanets." The largest of the first species frequents the mangrove trees on the sea-coast. The other two species are very common. "They feed entirely on the fruits of the forest," the same naturalist says, "and though of the pie kind, never kill the young of other birds, or touch carrion. The larger is called Bouradi by the Indians. They seem partial to each other's company, and often resort to the same feeding tree, and retire together to the same shady noon-day retreat. They are very noisy in rainy weather, at morn and eve. The sound which the bouradi makes is like the clear yelping of a puppy dog, and you fancy he says, 'Pia-po-o-co,' and thus the South American Spaniards call him Piapoco.

"All the toucanets feed on the same trees on which the toucan feeds, and every species of this family of enormous bill lays its eggs in the hollow trees. They are social, but not gregarious. You may sometimes see eight or ten in company, but you will find it has only been a dinner party, which breaks up and disperses towards roosting time."

"The bill of the toucan," says Mr. Jesse, "is out of all proportion to the size of the body of the bird. In fact, it appears an enormous excrescence, equally unwieldy and useless. This, however, is not the case. In endeavouring to ascertain the utility of the long beak of the toucan, we must refer to its food, the means of procuring it, the enemies it has to encounter, and the peculiar habits of the various animals of the country in which it is found. The toucan, like the woodpecker, deposits its eggs in the holes of trees. The bird itself, as well as its eggs, would become the prey of the numerous monkeys which inhabit the country if it had not so large a bill to defend itself. The toucan feeds much on the eggs of other birds. By means of its long bill, it is enabled to search for and reach them in the holes of trees, and also in the pendent nests of tropical birds. These nests are suspended from the extremity of branches of trees, as a security against monkeys, and have a hole in the side, into which the toucan is enabled to thrust its long bill. It is evident that this powerful bill is not required to break the food, since the bird seizes fruit or eggs at the extremity of it, and, by throwing back the head, deposits the food in its throat at once. We thus see that what at first appears a deformity is, on the contrary, a kind and useful provision of Nature to enable the bird both to feed and defend itself." Other naturalists have been led to differ from Mr. Jesse, as to the food of these remarkable birds.

Mr. Swainson, who had seen the toucans in their native forests, informed Mr. Broderip that he had frequently observed them perched on the tops of lofty trees, where they remained as if watching. This circumstance, joined to others connected with the remains of food found in the stomachs of such as were dissected, led to the suspicion that these birds were partly carnivorous, feeding on eggs and young birds, as well as fruits and berries; and that while perched upon these high trees, the toucans were, in fact, busily employed in watching the departure of the parent birds from the nest. Mr. Swainson could never catch the toucans in the fact, nor did anything appear in his dissections to determine with certainty on what they fed. Mr. Such informed Mr. Broderip that he had seen these birds in Brazil feed on the toucan-berry; that he had frequently observed them in quarrels with the monkeys; and that he was certain that the toucans fed on eggs and nestlings.

In the year 1824 a living toucan was exhibited in St. Martin's Lane, London. Mr. Vigors stated at a zoological club, that the bird had been fed on a vegetable diet; but that the proprietor had told him, that on the occasion of a young canary bird having escaped and gone near the toucan, the latter instantly seized and devoured the canary bird.

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* Ramphastidæ.

Mr. Broderip determined to bring the matter to the test on a visit to this bird, which was, apparently, in the highest state of health. A goldfinch, introduced into the toucan's cage, was seized and compressed so suddenly, that the poor little songster had only time to utter a short squeak before it was dead, with its bowels protruding. The toucan then hopped with it to another perch, and began to strip off its feathers. When it was nearly naked, it broke the bones of the wings and legs, taking them in its bill, and giving them a strong lateral wrench. Having reduced the little victim to a shapeless mass, it first swallowed the viscera, and then the remaining parts, piece after piece, not even rejecting the legs and bill. Mr. Broderip adds that he has sometimes observed it return its food from its crop, and swallow it again after a second mastication. "The food on which I observed him so employed," he says, "was a piece of beef, which had evidently been macerated for some time in the crop. While masticating it, he made the same hollow clattering noise as he made over the remains of the goldfinch. Previous to this operation, he had examined his feeding-trough, in which there was nothing but bread, which I saw him take up and reject; and it appeared to me that he was thus reduced from necessity to the above mode of solacing his palate with animal food. His food consists of bread, boiled vegetables, eggs, and flesh, to which a little bird is now added about every second or third day. He shows a decided preference for animal food, picking out all morsels of that description, and not resorting to the vegetable diet till all the former was exhausted.

THE SAFFRON COLOURED HILL TOUCAN.*

"It is said that the nerves are very much expanded within the internal surface of the bill in these birds; and independently of the sensual enjoyment which the toucan above mentioned appeared to derive from palating his prey, I have observed him frequently scratching his bill with his foot, which may be observed as furnishing additional evidence of the sensibility of this organ. While taking his prey, he never used his foot for the purpose of conveying it either to his bill or elsewhere. The bill was the sole vehicle, and the organ actively employed; the foot merely confined the prey on the perch."

Among the peculiarities of the bird exhibited in St. Martin's Lane, there was one that cannot be passed over in silence. When he settled himself to roost, he sat a short time with his tail retroverted, so as to make an acute angle with the line of his back; he then turned his tail over the right shoulder, nestling it on the soft plumage of the back—on which last the under mandible rested—till the bill was so entirely covered that no trace of it was visible. When disturbed, he did not drop his tail, but almost immediately returned his bill to the comfortable nidus from which, on being disturbed, he had withdrawn it. He broke some of his tail-feathers, but, before that accident, the toucan, when at roost, retroverted his tail so entirely, that the upper surface of the tail-feathers lay over and came in contact with the plumage of the back; so that the bird had the appearance of a ball of feathers. It appears that he always roosted in the same way.

Mr. Vigors kept a toucan in a state of domestication for many years, and of it he has given many interesting particulars. It was not allowed to be indulged in that disposition to animal food which so strikingly belongs to its family. Mr. Vigors found it thrive sufficiently well on a vegetable diet, and feared that if it were ever allowed any other, it would be difficult to restrain its inclination for it within moderate limits. Eggs were the only animal food with which it was supplied. Of these it was particularly fond, and they were generally mixed up in its ordinary food, consisting of bread, rice, potatoes, German paste, and similar substances.

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* **Andigena bailloni: Gould.**

It delighted in fruits of all kinds. During the period when these were fresh, it fed almost exclusively on them. Even in winter it exhibited great gratification in being offered pieces of apples, oranges, or preserved fruits of any description. These it generally held, for a short time, at the extremity of its bill, touching them with apparent delight with its slender and feathered tongue, and then conveying them by a sudden jerk to its throat, where they were caught and instantly swallowed. Its natural propensity to preying upon animals, though not indulged, was still strongly conspicuous. When another bird approached its cage, or even a skin or preserved specimen were presented to it, considerable excitement was exhibited. It raised itself up, erected its feathers, and uttered the hollow clattering sound which seemed to be the usual expression of delight in these birds; at the same time, the irides of the eyes expanded, and the toucan seemed ready to dart at its prey, if the bars of its cage permitted its approach. On one occasion, when a small bird was placed by chance over its cage at night, it showed great restlessness, as if aware of the neighbourhood of the bird; and it would not be composed till the cause of its disquietude was discovered and removed.

When in its cage, the toucan was peculiarly gentle and tractable, suffered itself to be played with, and fed from the hand. Out of its cage it was wild and timid. In general it was active and lively; and, contrary to what might be expected, from the apparent disproportion of the bill, and the seemingly clumsy shape of birds of this genus, as they are usually set up or represented in figures, its appearance was not only graceful, but its movements, as it glided from perch to perch, were light and sylph-like; so much so, indeed, as to lead to this bird being called Ramphastos *Ariel.* This toucan kept itself in beautiful plumage, its lighter colours being strikingly vivid, and the deep hue of its upper body in particular being always black and glossy. For this fine condition it seemed to be much indebted to its fondness for bathing. Every day it immersed itself in cold water, with apparent pleasure, even in severe weather, and in no respect did it seem to suffer by the transition from its own warm climate to an uncongenial atmosphere.

Besides the usual sounds of these birds, it uttered, at times, a hoarse and somewhat discordant cry when it happened to be hungry, and to see its food about to be presented to it. On such occasions it stood erect, raising its head in the air, and half opening its bill, as this cry was emitted. "These," says Mr. Vigors, "are the only sounds I have heard him utter; and in neither can I say that I have detected any similarity, or even approach, to the word 'toucan,' as has sometimes been asserted, and from whence the trivial name of the genus has been supposed to originate. Neither have I been able to verify another observation which has been advanced respecting these birds, that the bill is compressible between the fingers in the living bird. The bill, notwithstanding the lightness of its substance, is firm, and capable of grasping an object with much strength."

Mr. Vigors generally observed that this bird took what was offered rather by the sides than the point of the bill, and he suspected that much of the power of that member was centered in this lateral motion. On the cold weather commencing, it was brought into a room with a fire, and the unusual light seemed to interfere with its general habits; it did not then go to rest so early as had been its custom, and it sometimes even fed at a later hour. During the summer months, however, when more free from interruption, its habits were singularly regular. As the dusk of evening approached, the toucan finished its last meal for the day, took a few turns, as if for exercise after its food, round the perches of its cage, and then settling on the highest perch, disposed itself, almost at the moment of alighting, with its head drawn in between its shoulders, and its tail turned vertically over its back.

In this posture it generally remained for about two hours, in a state between sleeping and waking, its eyes for the most part closed, but opening on the slightest interruption. At such times it would allow itself to be handled, and would even take any favourite food that was offered, without altering its posture further than by a gentle turn of the head. It would also suffer its tail to be replaced by the hand in its natural downward posture, and would then immediately return it again to its vertical position. In these movements the tail seemed to turn as if on a hinge that was acted on by a spring. At the end of about two hours it began gradually to turn its bill over its right shoulder, and to nestle it among the feathers of its back, sometimes concealing it completely within the plumage, at other times leaving a slight portion of the culmen exposed. At the same time it dropped the feathers of its wings and those of the thigh-coverts, so as to encompass the legs and feet; and thus nearly assuming the appearance of an oval ball of feathers, secured itself against all exposure to cold.

Mr. Waterton was the earliest naturalist, with whom the writer is acquainted, that gave an accurate account of the appearance of the bill of the living toucan. He says, "Were a specimen of each species presented to you, you would pronounce the bill of the bouradi the most rich and beautiful; on the ridge of the upper mandible a broad stripe of most lovely yellow extends from the head to the point; a stripe of the same breadth, though somewhat deeper yellow, falls from it at right angles next the head down to the edge of the mandible; then follows a black stripe, half as broad, falling at right angles from the ridge, and running narrower along the edge to within half an inch of the point. The rest of the mandible is a deep bright red. The lower mandible has no yellow; its black and red are distributed in the same manner as on the upper one, with this difference, that there is black about an inch from the point. The stripe corresponding to the deep yellow stripe of the upper mandible is sky-blue. It is worthy of remark, that all these brilliant colours of the bill are to be found in the plumage of the body and the bare skin round the eye.

"All these colours, except the blue, are inherent in the horn; that part which appears blue is, in reality, transparent white, and receives its colour from a thin piece of blue skin inside. This superb bill fades in death, and in three or four days' time has quite lost its original colours.

"Till within these few years, no idea of the true colours of the bill could be formed from the stuffed toucans brought to Europe. About eight years ago" (we may now add to this time about twenty-eight years), "while eating a broiled toucan, the thought struck me that the colours in the bill of a preserved specimen might be kept as bright as those in life. A series of experiments proved this beyond doubt. If you take your penknife and cut away the roof of the upper mandible, you will find that the space betwixt it and the outer shell contains a large collection of veins and small osseous fibres, running in all directions through the whole extent of the bill. Clear away all these with your knife, and you will come to a substance more firm than skin, but not of so strong a texture as the horn itself; cut this away also, and behind it is discovered a thin and tender membrane, yellow where it has touched the yellow part of the horn, blue where it has touched the red part, and black towards the edge and point; when dried, this thin and tender membrane becomes nearly black; as soon as it is cut away, nothing remains but the outer horn, red and yellow, and now become transparent. The under mandible must undergo the same operation. Great care must be taken, and the knife used very cautiously, when you are cutting through the different parts close to where the bill joins the head; if you cut away too much, the bill drops off; if you press too hard, the knife comes through the horn: if you leave too great a portion of the membrane, it appears through the horn, and by becoming black when dried, makes the horn appear black also, and has a bad effect; judgment, caution, skill, and practice, will ensure success.

"You have now cleared the bill of all those bodies which are the cause of its apparent fading: for these bodies dry in death, and become quite discoloured, and appear so through the horn; and reviewing the bill in this state, you conclude that its former bright colours are lost.

"Something still remains to be done. You have rendered the bill transparent by the operation, and that transparency must be done away to make it appear perfectly natural. Pound some clean chalk, and give it enough water till it be of the consistency of tar; add a preparation of gum arabic to make it adhesive, then take a camel-hair brush, and give the insides of both mandibles a coat; apply a second when the first is dry, then another, and a fourth to finish all. The gum arabic will prevent the chalk from cracking and falling off. If you remember, there is a little space of transparent white in the lower mandible, which originally appeared blue, but which became transparent white as soon as the thin piece of blue skin was cut away; this must be painted blue inside. When all this is accomplished, the bill will please you; it will appear in its original colours."

THE DOUBLE-COLLARED ARACARI.*

In reference to the Double-collared Araçari, of which we give an engraving, Mr. Gould says, "The Messrs. Sturm state that the yellow crescent is only found on the breast of the females, and that the male is entirely devoid of it; but I suspect that this is not always the case, as it is very conspicuous in one of the specimens of the British Museum, which I have no doubt is that of a male." We give an engraving, also, of the Saffron-coloured Hill Toucan.

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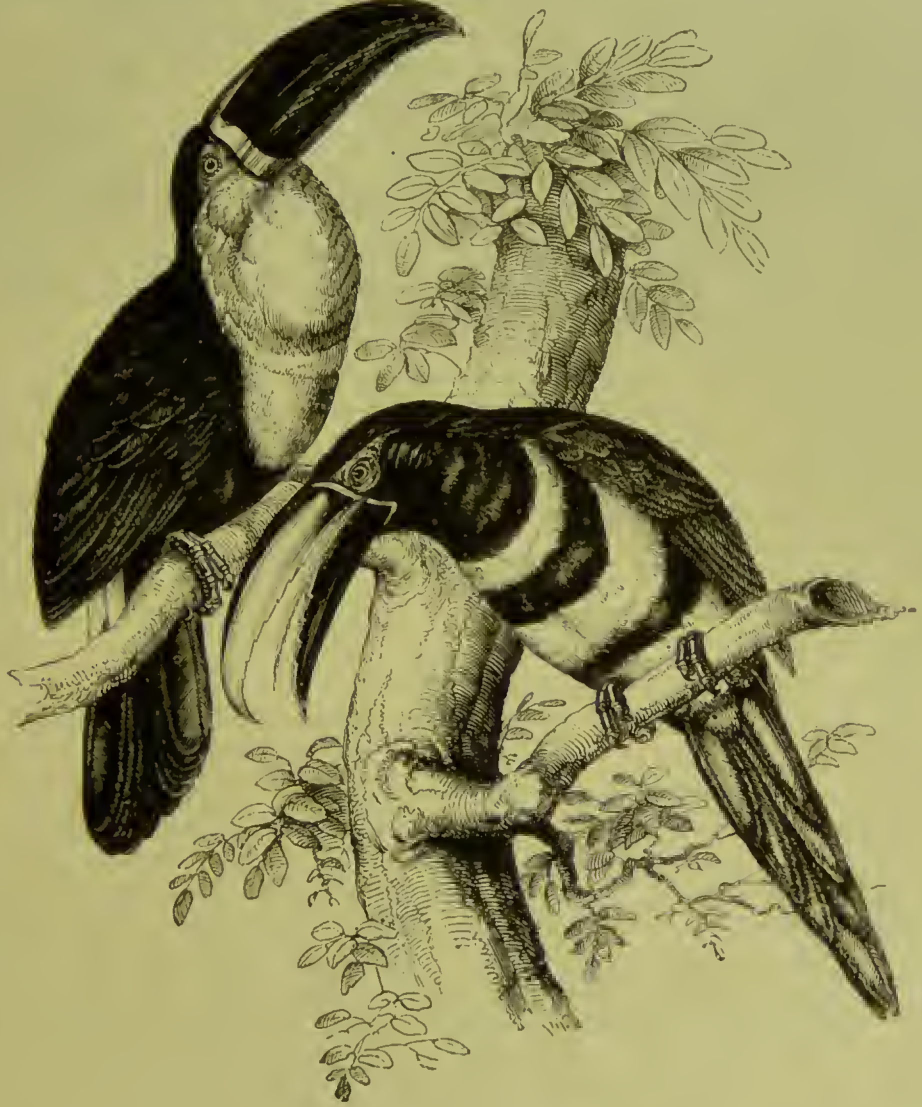
* Pteroglossus bitorquatus: Vigors.

THE PLANTAIN EATERS.*

Mr. Swainson raises this group of birds to the rank of a family. Their food is entirely vegetable, and of the most tender and delicate description. Their bill is short and compressed; the tongue is short and pointed; the wings are moderate; so also is the tail; the feet are strong; the lateral toes are unequal, the inner shortest; the claws are slender and slightly curved.



THE DOUBLE-COLLARED ARAÇARI.

The Chilian Plant-cutter is nearly the size of a quail. The colour is an obscure gray on the back, rather brighter on the belly; the points of the quills and of the tail are black. The sound of its voice is hoarse and interrupted. It feeds on plants, but previously has the destructive habit of cutting them off close to the root, and often cuts off capriciously a quantity of them, without touching them any further. For this reason the peasants persecute this species, and carry on against it a continual war; while the children who destroy the eggs of these birds are rewarded. A defence is provided in the nest being built in obscure and but little frequented places; but notwithstanding this, the numbers of this plant-destroyer are considerably diminished. "I do not know," says Molina, "whether this is because a price is set on its head, or on account of its naturally small degree of fecundity."

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* Musophagidæ.

The Colies* should also be noticed. The plumage of the species is soft and silky, and the colour generally sombre, whence they are called, at the Cape, mouse-birds. Africa and the East Indies are the localities in which they are found: the *Colius viridis* of Latham, said to be from New Holland, belongs probably to another genus. The colies are gregarious, live upon fruits, and are the scourges of gardens. They walk badly, but they climb almost continually on the branches of trees, where they hold on, assisting themselves with their bills, like the parrakeets. They build their nests, which are spacious and round, in little groups; and Le Vaillant affirms that they sleep suspended with their heads downwards, and that, when it is cold, they are found so benumbed in the morning, that they may be taken one after the other. The number of eggs is generally five or six; and Lesson says that the flesh of the birds is delicate.

To the Colies must be added, as belonging to the same family, the Touracos. They are most elegant birds, and feed principally on soft fruits. Their prevailing colour is green, varied, in some species, with purple on the wings and tail. They are natives of Africa, where they perch on the highest branches of the forest trees, and thus keep out of gun-shot. Le Vaillant, after many vain attempts, succeeded in bringing one to the ground, but he could not find it; and, stamping in his rage at the loss, he broke through into one of the covered pits which the Hottentots employed to catch ferocious animals, particularly elephants. This accident might have proved fatal. "When I recovered my first surprise," he says, "I began to consider how I should extricate myself from this embarrassment, extremely happy that I had not been impaled on the sharp-pointed stake placed in the bottom of the pit, and still happier that I found in it no company. I was, however, apprehensive that some might arrive every moment, especially if I should be obliged to remain there during the night." In this dilemma he fired his fusee at intervals; the shots, at last, were answered, and he was rescued by his Hottentots. But he did not forget his touraco; and now, by the aid of his dogs, which had followed the Hottentots, found it squatted under a tufted bush. He afterwards laid snares for these birds on the fruit trees to which they resorted to feed, and took them alive. With these birds we close our account of the ZYGODACTYLI, and proceed to the RASORIAL, or GALLINACEOUS.

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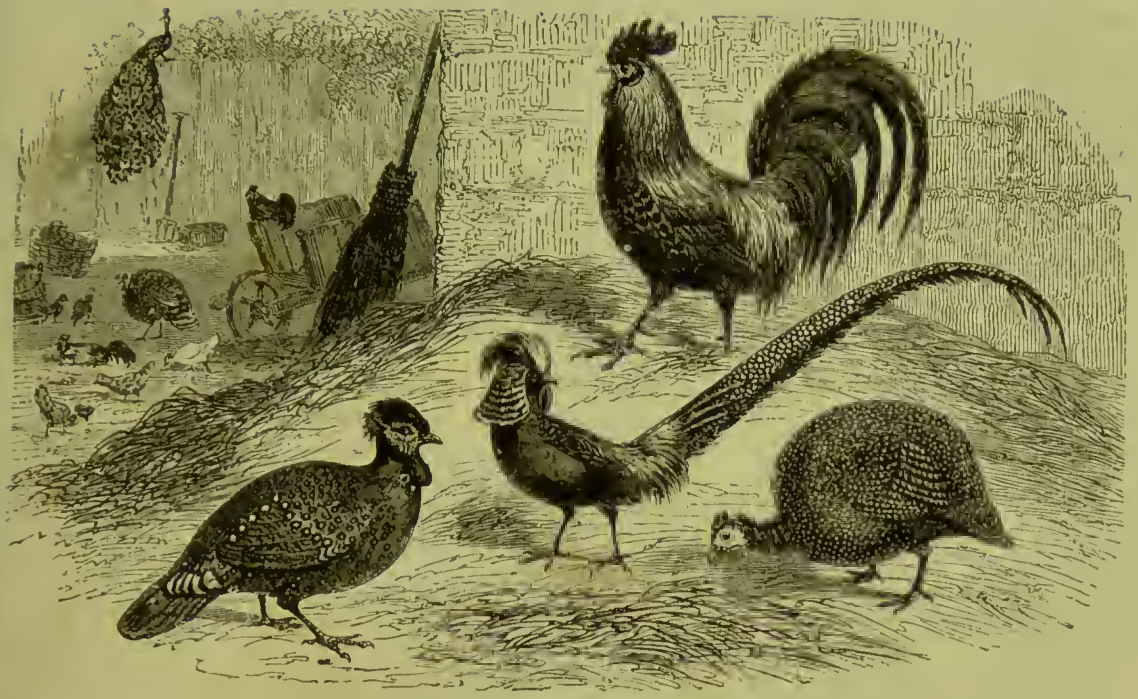
* Colinæ.



GALLINACEOUS BIRDS.*

The general character of the Gallinaceous birds is sufficiently clear and distinct. They are all granivorous, feeding principally, and almost exclusively, on vegetable diet. In some species the young are fed on the larvæ of ants, in addition to grains or berries. Some are exclusively terrestrial in their habits, being incapable of rising from the ground, from the rudimentary condition of their wings.

The body is stout, plump, and heavy, and, with some exceptions, the wings are round and concave, rendering flight slow and laborious. The limbs are generally strong and muscular, and the hind toe, instead of being placed on a level with the anterior portion of the foot, as in the case with birds of the Insessorial order, is more or less elevated on the tarsus, so that in many examples its point only touches the ground, and sometimes not even that; while in others it is wanting entirely. In accordance with the nature of the food, the beak is strong and horny; but at its base there is a space covered with a tough membrane, and in which the nostrils are situated.

From the muscularity of the limbs and the strength of the claws, the birds of this group are, for the most part, capable of scratching up the surface of the ground in quest of insects or grains. Many delight to throw the dust over their plumage, and wallow in the dry gravel or sandy earth. Swampy, humid situations are their aversion, and a continuation of heavy rains renders them dull and spiritless. In some, as in the grouse tribe, the wings are pointed; but even in these, flight is not performed without considerable exertion and a rapid vibration of the wings, accompanied by a loud whirring. This almost startling sound to an ordinary ear is familiar to those who have "put up" pheasants and coveys of partridges.

One peculiarity appears in the internal structure of the present group of birds—it is a strong muscular gizzard, lined with a tough, leathery membrane. By the action of its two muscular sides on each other, the seeds and grains, previously macerated in the crop, and there softened by a peculiar secretion oozing from glandular pores, and then swallowed, are ground up and triturated, in order that their digestion may take place.

The gallinaceous birds are very prolific, and most are polygamous. As a rule, the nest is generally placed on the ground; the young are hatched covered with down, and, in a few hours, are capable of running about and following their parent. They pick up the food to which the mother conducts them, without having to be fed like the young of the finches and warblers in their snug nests till they acquire the power of flitting alone. At night they find repose huddled up beneath their mother's wing.

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* Gallinæ.

The males of the species are extremely pugnacious, and will often fight till the death of one of the rivals. The females are devoted to their broods, and lose all sense of personal danger in their defence. Of none of the gallinaceous birds is the flesh unfit for food. That of many is a delicacy, and at the same time easily digestible and highly nutritious. The qualities of pheasants, partridges, quails, and grouse certainly need no recommendation.

The first family of the present order is that of the Pigeons.*

THE CROWNED GOURA PIGEON.†

This magnificent and beautiful bird is a native of many of the islands of the great Indian Archipelago, being by no means rare in Java and Banda. In New Guinea it is abundant, as well as in most of the Molucca Islands. It inhabits the forests, and feeds upon berries, seeds, and grain. It exceeds in size all the other Columbine species, being from twenty-seven to twenty-eight inches in extreme length. The bill, which is two inches long, is black; the tips of the mandibles are thickened, and that of the upper one moderately deflected. The head is adorned with a large, elevated, semi-circular, and compressed crest, composed of narrow, straight feathers, furnished with disconnected silky barbules, and always carried erect. This, as well as the head, the neck, and all the inferior parts of the body, are of a pure grayish-blue colour. Its nest is built upon a tree.

These birds are easily rendered tame; and in the East Indies they are frequently kept in court-yards, as poultry. They have all the habits of the common pigeons—billing, inflating the breast, and cooing. The sounds which they emit, however, are far from being so gentle as those to which we apply that term; they rather become a loud noise. It is said that M. Bougainville's sailors were greatly alarmed on hearing it for the first time, in the wild and unfrequented spots of some of the islands they visited; and no wonder, when they considered it to proceed from the savage cries of hostile natives in their ambush about to break forth upon them. Fear, when once excited, as is well known, strangely exaggerates what is seen, as well as what is heard.

THE CARRIER PIGEON.

Such is the name given to one species of this numerous family, from the circumstance of the birds belonging to it carrying letters and small packets from one place to another. The Carrier pigeon is easily distinguished from the other varieties by a broad circle of naked white skin round the eyes, and by its dark blue or blackish colour.

Sandys traces the use of these birds to a remote antiquity. He states that Thomostones gave notice to his father in Ægina, of his victory at the Olympian games the same day, by means of a pigeon stained with purple.

When, during the Crusades, Acre was besieged by the Christian forces, Saladin kept open a correspondence for some time with the besieged by means of these winged messengers; but one having been accidentally brought to the ground, by means of an arrow, before it reached the city, the stratagem was discovered, and the communication which would have animated the courage of those to whom it was addressed, by the announcement of speedy succour, being thus betrayed to the Christians, such measures were taken as compelled the surrender of Acre before Saladin could arrive to relieve it.

In former times the pigeon was employed in the English factory to convey intelligence from Scanderoon to Aleppo of the arrival of the company's ships in that port. The name of the ship, the hour of her arrival, and whatever else could be comprised in a small compass, was written on a slip of paper, and secured under the pigeon's wing, so as not to impede her flight; while her feet were bathed in vinegar to keep them cool, and prevent her being tempted by the sight of water to alight, whereby delay might have been occasioned, and the billet lost.

The pigeons have been known to perform the journey in two hours and a half, the distance being betwixt sixty and seventy miles in a straight line. The messenger-bird had a young brood at Aleppo,

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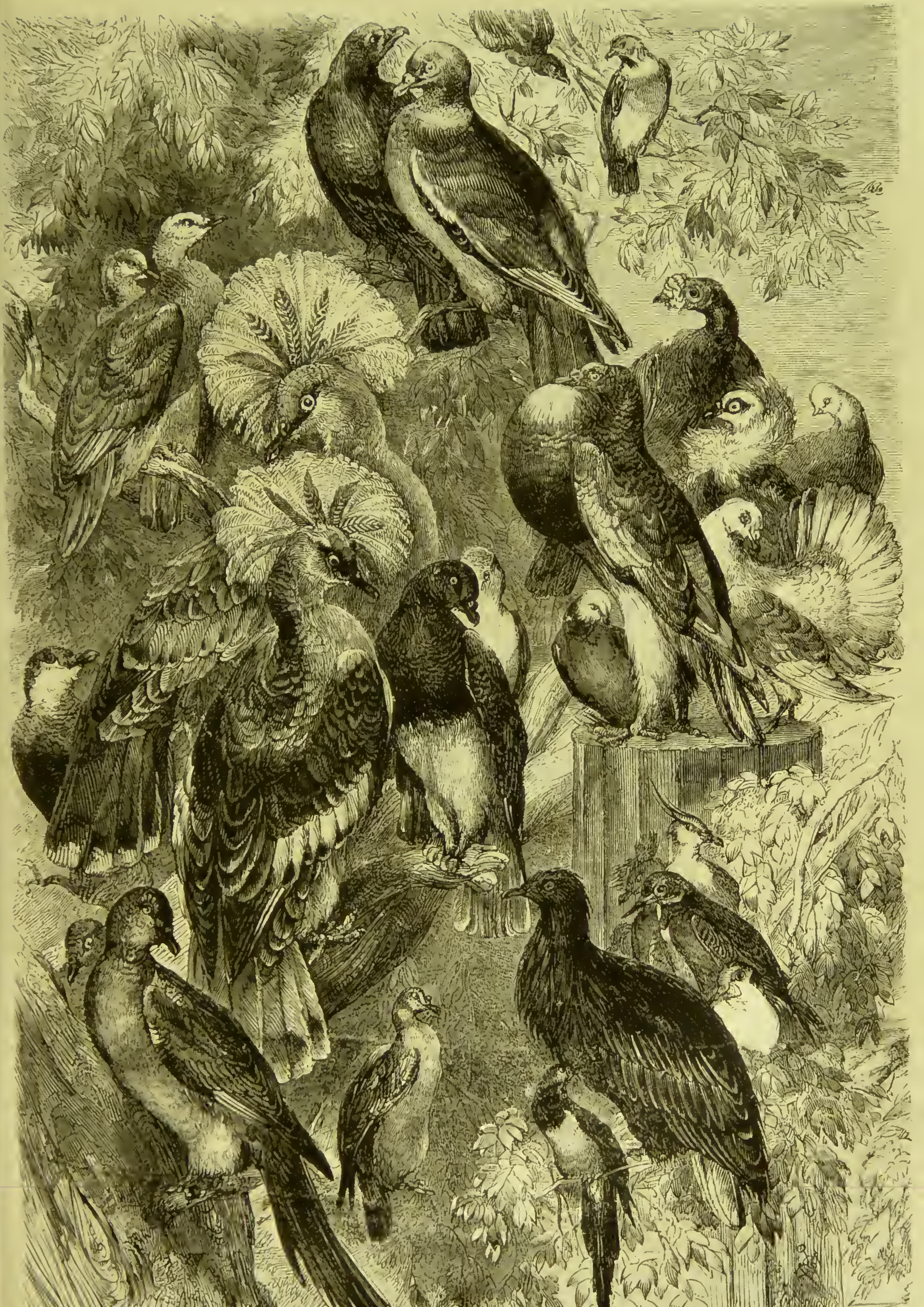
* Columbidæ.

† Lophyrus coronatus: Vieillot.



GROUP OF PIGEONS.

and was sent in an uncovered cage to Scanderoon, from whence, as soon as set at liberty, she returned with all speed to her nest. It was then usual, when the season had come for the arrival of the ships, to send pigeons to be ready at the port, but if the bird remained more than a fortnight she would forget her young, and could not safely be trusted. The pigeons, when let fly from Scanderoon, instead of bending their course towards the high mountains surrounding the plain, mounted at once directly up, soaring almost perpendicularly till out of sight, as if to surmount at once all obstacles intercepting their view of the place of their destination.

The rapidity of the flight of these birds is truly astonishing. Lithgow states that one of them would carry a letter from Babylon to Aleppo—which was usually to a man a thirty days' journey—in the space of forty-eight hours. A wager was laid, some years ago, to determine the speed of these birds with some approach to exactness. A gentleman sent a carrier-pigeon from London, by the coach, to a friend in Bury St. Edmunds, in Suffolk, and with it a note, desiring that the pigeon, two days after its arrival there, might be thrown up precisely when the town clock struck nine in the morning. Accordingly, this was done, and the pigeon arrived in London, and flew into the Bull Inn, in Bishopsgate-street, at half an hour past eleven o'clock on the same morning, having accomplished a flight of seventy-two miles in two hours and a half.

THE CROWNED GOURA PIGEON.

The attachment of the bird to its native place, and particularly to the spot where it has brought up, or is bringing up its young, was thus rendered useful to mankind. The bird was conveyed from its home to the place whence the information was intended to be sent, with the letter attached to its wing. At the instant of being let loose, its flight was directed, at an amazing height, to its home. By a remarkable instinct it darted onwards in a straight line to the very spot from whence it was taken; but how it could direct its flight so exactly is a problem which we shall find it not very easy to solve.

"It must not be supposed," says Mr. W. C. L. Martin, "that this peculiar breed of pigeons is exclusively fitted for the purposes above described; any breed of good powers of flight will do, but this bird, from its swiftness on the wing, and its muscular energy, is doubtless superior; nevertheless, old birds, if not kept in active training, are heavy, and disinclined to very long flights. We once purchased a very young pair of black carriers, and having shut them up for a few weeks, gave them their liberty; after several circles high in the air, they started off in one direction, straight as an arrow, far out of sight.

"We gave them up for lost, and having paid a considerable sum for them, were not a little annoyed. This happened about eleven A.M. At about 4 P.M., while on the look-out, we heard a whirring of wings, and immediately the two birds settled on their dove-cote, and were eager for food and drink. Let it be remembered that they had never been previously at liberty, and yet, after a voluntary excursion of many miles, they returned with unerring precision to their home. This was repeated so often till they began to breed, that it gave us no concern respecting their safety, the more especially as they flew above gun-shot reach.

THE CARUNCULATED GROUND PIGEON.

"Is it by the eye that these birds travel from long distances to their homes? We cannot doubt it. Hence, if very long distances are to be achieved, training is requisite; they must be accustomed, by a graduated series of removals, to at least the greater part of the road; and even then, if a fog obscures their waymarks, they are apt to wander and be lost.

"Short distances, however, will easily be performed without much training. Our theory is as follows: A carrier pigeon is taken to a distance, say a hundred miles from home; it is turned loose, it mounts to a great elevation, and performs a series of circles, wider and wider still. At home it has performed the same. Now, from any part of the circle let it perceive an object which, while performing its circles at home, has caught its eye, it has at once a clue to the right direction: that object attained, a succession of others familiar to it are rapidly passed, till its home greets its keen and long-surveying powers of vision."

THE CARUNCULATED GROUND PIGEON.*

We have selected this bird from the decided analogy, or rather affinity, it shows to the true gallinaceous tribes—a likeness which is rendered still more striking by the accessory appendages which ornament the face and throat, and bear so direct an analogy to the wattles of the common domestic fowl.

This bird is a native of South Africa, and was first discovered by Le Vaillant in the Namaqua country. It builds its nest on the ground in some slight depression, making it of twigs and the stems of dried grasses, upon which the female deposits from six to eight reddish-white eggs, which are incubated alternately by both sexes.

In size it about equals the common turtle, but is thicker and rounder in the body. The base of the bill and forehead is covered with a naked red skin, and the chin is ornamented with a large wattle, which turns upwards on each side toward the ears. The head, the cheeks, the neck, and the breast, are of a purplish-gray; the mantle, the scapulars, and the wing-coverts are pale-gray; the feathers are finely margined with white.

These pigeons inhabit the forests of India, the Moluccas, Celebes, Australia, and the Pacific Isles. Their food consists of fruits and berries. That of the precious nutmeg, or rather its soft covering, known to us by the name of mace, affords at certain seasons a favourable repast to some species, and upon this luxurious diet they become so loaded with fat as frequently, when shot, to burst asunder when they fall to the ground. And here we may observe the remarkable provision Nature has made for the propagation, as well as dissemination, of this valuable spice; for the nutmeg itself, which is generally swallowed with the whole of its pulpy covering, passes uninjured through the digestive organs of the birds, and is thus dispersed throughout the group of the Moluccas and other islands of the East. Indeed, from repeated experiments, it appears that an artificial preparation, analogous to that which it undergoes in its passage through the bird, is necessary to insure the growth and fertility of the nut; and it was not till after many unsuccessful attempts had been made that a lixivium of lime, in which the nuts were steeped for a certain time, was found to have the wished-for effect, and to induce the germinating tendency. The fruit of the banyan,† the sacred tree of the Hindoos, is also a favourite repast of many pigeons.

Pigeons, it may be remarked, constitute a large and varied tribe. They are naturally birds of a wild and timid disposition, though one species has been partly reclaimed, and usually lives congregated in extensive flocks, except during the season of reproduction, when they pair. Most of the species seek their food upon the ground. This consists of the different cerealia, as also acorns, beech-mast, and other seeds, and occasionally of the green and tender leaves of peculiar plants. They drink much—not at intervals like other birds, but by a continued draught, like the quadrupeds. Their flesh is sapid and nutritious, being of a warm and invigorating nature. Their flight is powerful, very rapid, and can be long sustained, and many species are in the habit of making distant periodical migrations. They are widely disseminated, species of the genus being found in every quarter of the globe, and in all climates, except the frozen regions of the two hemispheres. They build in trees or holes of rocks, making a shallow nest of small twigs loosely put together. Their eggs are never more than two in number, their colour a pure white; they are incubated alternately by both sexes, and are hatched after being sat upon from eighteen to twenty-one days. The young, upon exclusion, are thinly covered with down, which is rapidly succeeded by the proper feathers.

In no tribe of the feathered race do we meet with a plumage better adapted to gratify and delight the eye than that of the pigeons, for among the numerous species of which it is composed there exists a diversity as well as a brilliancy of effect that cannot be contemplated without admiration. In some the plumage shines with a dazzling and metallic gloss, varying in tint with every motion of the bird, and which vies in lustre with that of the diminutive and sparkling humming-bird. Such is that of the *Carpophaga ænea*, *Oceanica*, and many other species. In other genera, as *Vinago* and *Ptilinopus*, the plumage is admirably assimilated to the arboreal habits of the pigeons, consisting of delicate shades of yellows and vivid greens, just sufficiently contrasted with smaller masses of richer or more resplendent hues to produce the happiest effect. In the typical groups again, a modest, yet chaste assortment of colours generally prevails, and which, though less striking at first sight, never fails to give permanent satisfaction to the eye. As the species approach the true Rasorial tribes, the colours become more uniform in tint, but still in certain lights are encircled by glossy reflections, which especially prevail upon the region of the neck and breast.

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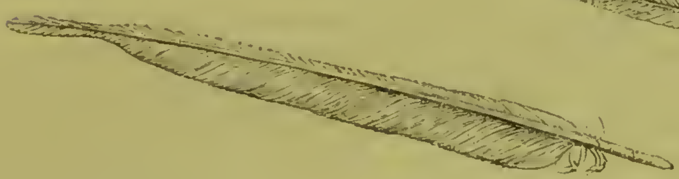
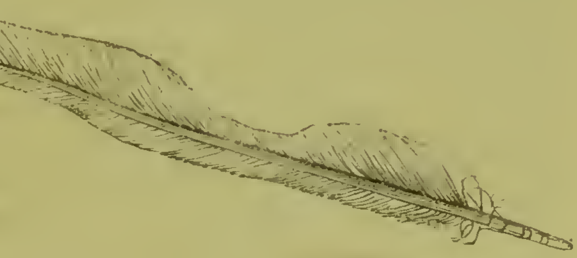
* Geophilus carunculatus.

† Ficus Indica.

In texture the plumage is generally close and compressed, and the feathers feel hard and firm to the touch, from the thickness and strength of the rachis or shaft. Upon the neck they assume a variety of forms, in some species being rounded and stiff, and disposed in a scale-like fashion; in others they are of an open, disunited texture, or with the tips divided and curiously notched; and in the *hackled* and *Nicobar* pigeons they are long and acuminate, like those of the domestic cock; and we may add, that in nearly all they are so constituted as to reflect prismatic colours when held at various angles to the light.

In all the species of the genus *Vinago* submitted to examination, the third quill has the central part of the web deeply notched, as if a piece had been cut out, as represented in the annexed engraving.


FEATHER OF PTILINOPUS.


FEATHER OF VINAGO.

The genus *Ptilinopus* presents another peculiarity. Here the first quill feather of the wings is considerably shorter than the second, and suddenly narrowed towards the tips, as the engraving will show. This peculiarity is also possessed by several pigeons belonging to other distinct groups, and by which means a connection is thus kept up between them.

One of the tricks practised on the 1st of April in former days was, to send those on whom it was to be played for half a pint of pigeon's milk; but as a black swan, long deemed an impossibility, has actually been found, so has the substance for which many have been sent on a fool's chase. Alluding to a provision that exists very similar to that of the milk in quadrupeds, the celebrated John Hunter makes the following statement:—

"I have, in my inquiries concerning the various modes in which young animals are nourished, discovered that all the dove kind are endowed with a similar power. The young pigeon, like the young quadruped, till it is capable of digesting the common food of its kind, is fed with a substance secreted for that purpose by the parent animal—not, as in the mammalia, by the female alone, but also by the male, which perhaps furnishes this nutriment in a degree still more abundant. It is a common property of birds, that both male and female are equally employed in hatching and in feeding their young in the second stage; but this particular mode of nourishment, by means of a substance secreted in their own bodies, is peculiar to certain kinds, and is carried on in the crop.

"Whatever may be the consistence of this substance when just secreted, it most probably very soon coagulates into a granulated white curd, for in such a form I have always found it in the crop; and if an old pigeon is killed just as the young ones are hatching, the crop will be found as above described, and in its cavity pieces of white curd mixed with some of the common food of the pigeon. If we allow either of the parents to feed the young, its crop, when examined, will be discovered to contain the same curdled substance, which passes thence into the stomach, where it is to be digested.

"The young pigeon is fed for some time with this substance alone, and about the third day some of the common food is found mingled with it; and, as the pigeon grows older, the proportion of common food is increased, so that by the time it is seven, eight, or nine days old, the secretion of the curd ceases in the old ones. It is a curious fact that the parent pigeon has at first the power to throw up this curd without any mixture of common food, although afterwards both are thrown up according to the proportion required for the young ones. I have called this substance curd, not as being literally so, but as resembling that more than anything I know. It may, however, have a greater resemblance to curd than we are, perhaps, aware of, for neither this secretion, nor curd from which the whey has been pressed, seems to contain any sugar, and does not run into the acetous fermentation. The property of coagulating is confined to the substance itself, as it produces no such effect when mixed with milk."

THE AROMATIC VINAGO.*

This bird may be taken as a specimen of the genus *Vinago.* They are of a mild and timorous disposition, and are generally seen in flocks and societies, except during the period of reproduction, when they pair, and retire to the recesses of the forest. The nest is simple, and composed of a few twigs loosely put together, and the eggs are two. The base, or softer part of the bill, is a blackish-gray, the tip yellowish-white, strong, much hooked, and bulging on the side. The forehead is a bright siskin-green, the crown greenish-gray, the chin and throat gamboge-yellow, the remainder of the neck, the breast, belly, lower back and rump, yellowish-green. The upper back or mantle, and a part of the lesser wing-coverts, are of a rich brownish-red, and exhibit a purplish tinge in certain lights. The legs and toes are red, the claws pale gray, strong, sharp, and semi-circular.

"This beautiful bird," says Mr. Selby, "has brilliant red eyes. Its feet are something like the parrots, and it climbs in the same way as that breed. It is very difficult to find, for although a flock is marked into a tree, yet its colour is so similar to the leaf of the banyan, on the small red fig of which it feeds, that if a bird does not move, you may look for many minutes before you can see one, although there are fifty in the tree."

THE MAGNIFICENT PIGEON.

The rich assemblage of colours exhibited in this bird induced M. Temminck, its first describer, to give it the appropriate name of magnificent. It is a native of the eastern parts of Australia—a country whose productions present so much of what is new and interesting in every department of zoology. It is said to feed chiefly upon the fruit of one of the palms, in that country called the cabbage-tree, from the culinary use made of the top, or embryo leaves. In size it equals, or rather surpasses, the common ring pigeon—the tail being longer in proportion. The bill, which is rather slender, has the soft or membranous part of a brownish-orange; the horny top, which is yellowish-white, is slightly arched, but hard and compressed; the nostrils are open, and their covering but little swollen, and not projecting to the same extent as in the common pigeon; the forehead, as in other members of this restricted genus, is low and flat, and some of the feathers cover a considerable portion of the soft part of the bill. The head, the cheeks, and the upper part of the neck, are of a fine, pale bluish-gray, which passes into pale green towards the lower part of the neck and back. The upper parts of the body are of a rich golden-green, assuming various shades of intensity as viewed in different lights; the wing-coverts are spotted with rich king's yellow, forming an oblique bar across the wings. The quills and tail are of the richest shining green, changing in effect with every motion of the bird. From the chin downwards proceeds a streak of the finest auricular purple (the base of the feathers being of a deep sapphire-green); this line gradually expands as it descends and covers the whole breast and abdomen. The lower belly, thighs, and under wing-coverts are of the richest king's yellow. The feet are bluish-black, the tarsi short and clothed with yellow feathers half-way down their fronts and sides; the claws strong, much hooked, and formed for prehension. Nearly allied to this species, if not a small variety of it, is the *Columba amarantha* of Lesson, which inhabits the islands of New Zealand and New Guinea.

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* Columba aromatica: Latham.

THE NICOBAR PIGEON.*

This beautiful bird, though of a heavy form and ungraceful carriage, yields to none of its tribe in splendour of plumage, of which the prevailing hue is rich metallic green, with various reflections of copper and purplish-red. It is generally described as residing habitually upon the ground, where it runs with great celerity, perching on the lower limbs of trees at night. Yet Mr. Bennet alludes to this species as usually seen perched on trees, even on the loftiest branches, "where," he adds, "it rears its young similar to all the pigeon tribe." It inhabits Nicobar, Java, Sumatra, and other eastern islands.

HEAD OF NICOBAR PIGEON.

FOOT OF NICOBAR PIGEON.

THE RING-DOVE, OR CUSHAT.†

This is a bird widely disseminated throughout Europe, either as a permanent resident, or as a periodical visitant; in the first state, in all those countries where the climate and temperature are such as to insure a constant supply of food; and in the latter, in those high latitudes where the rigour of winter is severely felt, and the ground for a long period remains covered with snow. Of its geographical distribution in other quarters of the globe, we can only speak with uncertainty, as it is evident that species, bearing a resemblance in form and colour, have been mistaken for it, and as such recorded in the relations of various travellers. Temminck mentions it in his "History of the Pigeons," as inhabiting parts of Northern Asia and Africa, and it is known to be a native of Madeira, as well as another nearly allied species, lately described in the "Illustrations of Ornithology," under the title of the Columba Trocaz. In America it has not yet been recognised, neither does it appear among the species which abound within the tropical latitudes of the ancient world. In Britain, it is distributed from one extremity of the kingdom to the other, residing permanently with us; for, though subject to a partial movement upon the approach of winter, when the various individuals scattered over the country collect together and form extensive flocks, no actual migration takes place, but these congregated masses still keep within their respective districts. The magnitude of these winter flocks has, no doubt, suggested the idea that a migration from distant climes to this country annually takes place at this season of the year, and that the numbers of our native stock are thus augmented. We see no necessity, however, for supposing this to be the case, nor is it authorised by any observed or established fact. The species in districts favourable to its increase appears to be sufficiently numerous to account for the largest bodies ever seen assembled together.

This congregating of the ring-pigeons takes place towards the end of October or beginning of November, at which time all the autumnal broods have become fully fledged, and they remain thus united till the beginning of February, when the first mild days and the genial influence of the ascending sun again call forth those instinctive feelings which urge them to separate and pair, and each to seek an appropriate retreat for the rearing of a future brood. At first, when thus congregated, they haunt the stubbles, or, in districts producing an abundance of beech-mast or acorns, the woods and trees; but as these resources become exhausted, they resort to the turnip-fields, the leaves and tops of which root they greedily devour. This food now constitutes their principal support during the winter and early spring months, or until the clover begins to sprout and the seed-corn is committed to the earth; and it has been observed that the increase of the species has been progressive with that of the culture of this valuable root. The numerous and extensive plantations that of late years have been so generally made throughout the island, and which, in a young and close-growing state, are peculiarly favourable to its habits, must also be taken into account, and perhaps these tend, in an equal degree, to the cause above assigned—the rapid increase of its numbers. When thus united, they repair to their feeding ground early in the morning, and again in the afternoon before they retire to roost, the middle of the day being passed in repose or digesting their first meal, upon the nearest trees. When thus perched, some are always on the watch; and so great is their vigilance, that it is almost impossible by any device to get within gun-shot. In the evening they retire to the woods to roost, preferring those of the fir tribe and ash to any other; and in these nocturnal retreats great slaughter is sometimes committed, by waiting in concealment their arrival, which regularly takes place immediately after sunset.

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* Columba Nicobarica: Latham.

† Columba palumbus: Linnæus.

The first mild weather in February produces an immediate effect upon these congregated pigeons, and we may almost calculate to a day when their cooing and plaintive murmurs will again be heard in their wonted summer haunts. The flocks are now seen daily to decrease in magnitude, and in a short time every wood and copse becomes peopled with the numerous pairs of this lovely bird. The male soon after commences a flight peculiar to the season of courtship and love; this is a rising and falling in the air, by alternate movements, in which flight, and when at the greatest elevation, the upper surfaces of the wings are brought so forcibly into contact, as to be heard at a considerable distance. Nidification soon follows this well-known signal, and by the end of April, the young in many instances are fully fledged and ready to quit the nest. Few, however, of the early brood, comparatively speaking, attain maturity, as the eggs at this season, from the naked state of the woods, are early discovered by the prying eye and inquisitive habits of the cunning magpie and predacious carrion crow.

The nest of the cushat is a flimsy fabric, being a mere platform of small twigs loosely interwoven, so open, indeed, that the eggs, in one newly built, and before it becomes thickened by the dropping of the brood, may be seen through it from beneath; and so slight is the central depression that it frequently happens, where the incubating bird is suddenly disturbed, the eggs, in the hurry to escape, are tumbled from the nest, and perish upon the ground. The site selected for nidification is various, and no tree or bush seems to come amiss at certain periods of the year. In early spring, however, and before the deciduous trees acquire their umbrageous and leafy covering, firs and other evergreens are preferred, on account of the better concealment and protection they afford. From this diversity of site, the nest is necessarily placed at various elevations, at one time being far removed from the ground, as when it is built near the summit of a lofty spruce, or in the thick foliage of a beech or sycamore; at another, scarcely out of reach, and but a few feet from the earth, as we find it in the holly, the young fir, the thorn, or other bushy trees. The eggs, always two in number, are white, of an oblong form, and rounded nearly equal at both ends. Incubation lasts from eighteen to twenty days, and both sexes sit alternately, the male taking the place of his mate when hunger compels her to quit the nest, and so *vice versa*. When first extruded, the young are blind, and their skin, of a blue or livid colour, thinly covered with a harsh yellow down. In this tender state, they are long and assiduously brooded over by the parent birds, and are fed with a milky pulp, ejected from the crop, where the food undergoes a partial digestion, preparatory to its being given to them. As they gain strength and become fledged, food is more frequently supplied, and, consequently, from its not remaining so long in the craw of the old bird, in a less and less comminuted form, till at length, previous to their finally quitting the nest, it is administered in a state but little altered from that in which it is first swallowed by the old birds.

The cushat is a wary bird, of powerful wing, not easily approached even in the forest glades, yet not seldom building in groves or groups of trees in the immediate vicinity of human dwellings; and a gentle pair has been observed sitting for hours upon the branches of an almost leafless sycamore in early spring, preening their feathers in assured confidence, within a few footsteps of the cottage door. Indeed, we have often noticed, as others must have also done, what may be called the *discrimination* of birds, in relation both to persons and to places. We allude to what we should call their accommodating rather than their natural instincts; how, for example, after a season or two of observation or experience, they will congregate around a spot where no rude hands disturb their mossy dwellings, nor climbing urchin shows his visage grim among the umbrageous boughs. This is beautifully exemplified (and on a larger scale than in a cottage garden) among the gladsome palace groves of the Tuileries and Luxembourg in Paris, where, notwithstanding the gay and giddy stream of life which constantly flows through those royal walks, the wood pigeon frequently builds her nest, though distant is her flight to rural solitudes for every offering which she brings her much-loved young.

The ring pigeon breeds twice in the year, viz., in spring, and again in autumn, a cessation taking place during the greater part of June and July, being a period of comparative scarcity, the seeds of such plants as they principally subsist on having then ripened or attained perfection. The autumnal brood, on account of the more effectual concealment of the nests by the now matured and thick foliage of the woods, is always more abundant than that of spring, and, in favourable districts, great numbers annually escape. In certain seasons, the young produced in autumn are subject to a peculiar disease, which destroys many of them even after they have quitted the nest. It appears in the form of large swellings, or impostumes, upon the feet and head, which, rapidly increasing, at length deprive them of sight and the power of perching, and they perish upon the ground, emaciated by hunger and disease. This complaint, for many years past, has been observed in the northern districts of the kingdom, but whether it prevails to an equal extent in other parts we have had no opportunity of ascertaining. The flesh of both old and young is of good flavour, that of the latter being little inferior to the moor game or grouse, which it is thought by many to resemble in taste. This, however, can only be said of it so long as the bird derives its support from the stubbles, or the produce of the forest; for as soon as a deficiency of other food compels it to resort to the turnip-field, the flesh becomes imbued so thoroughly with the strong flavour of the plant, as no longer to be fit for the table.

THE RING-DOVE.

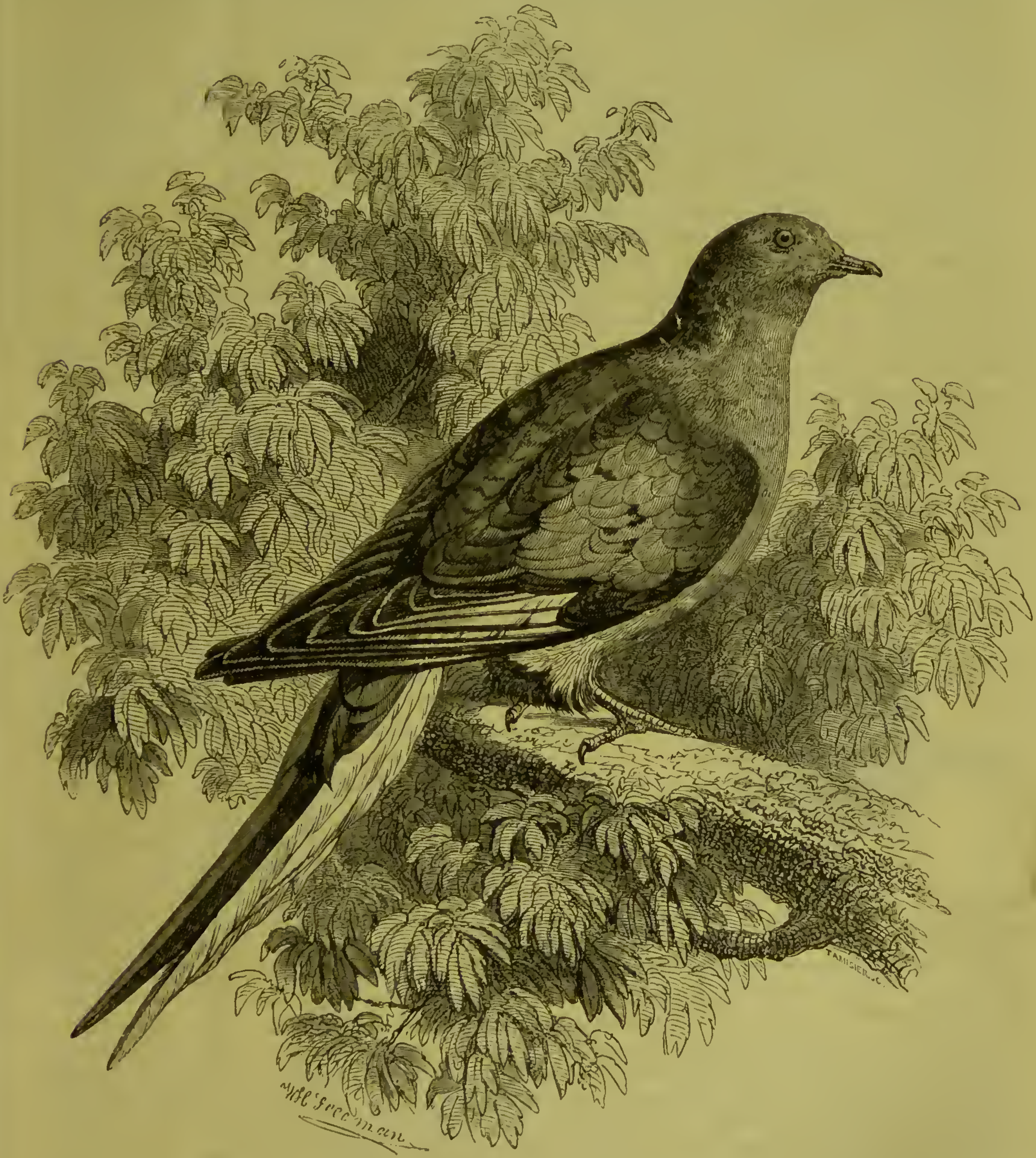
Though the ring pigeon frequently approaches our habitations during the breeding season in search of a site for its nest, and almost seems to court the vicinity of man, it always evinces a timorous disposition, and is startled and alarmed by the slightest motion or noise. In the winter, and when congregated, it becomes still more impatient of approach, and is then one of the most wary and watchful of the feathered race.

Various attempts have been made to domesticate the ring pigeon, but hitherto without success, for, although these birds may be rendered very tame when in confinement, they show no disposition to breed even by themselves, much less with the common pigeons, and upon being set at liberty, soon lose any little attachment they may have shown to the place in which they were reared, and betake themselves to their natural haunts to return no more.

Taking the species as a typical example of the restricted genus *Columba*, we find the bill of moderate strength, the tip without emargination, and gently arched, the nostril protected by a soft inflated membrane; the wings calculated for vigorous flight, the second and third quills being the longest, and nearly equal; the tail is square or even at the end; the tarsi short, and the feet adapted either for perching or walking; the outer and inner toes are of equal length, the hinder rather shorter than the tarsus, and not provided with so broad and flat a sole as that of the true arboreal pigeons. In size it is superior to the majority of the *Columbidæ*, measuring from sixteen to seventeen inches in length. The horny part of the bill is orange-yellow, the basal or soft part impending the nostrils

THE PIGEON HOUSE.

covered with a white mealy substance. The head, cheeks, throat, neck, lower back, and rump, are bluish-gray, those of the side of the neck glossed with green, and bounded with a patch of white, which nearly meets behind, and forms an imperfect demi-collar round the lower and back part of the neck. The mantle, scapulars, and wing-coverts are deep bluish-gray; the breast and belly purplish-red, passing towards the vent and under tail-coverts into pale bluish-gray. The outer ridge of the wing and a few of the greater coverts are white. The quills are blackish-gray, their anterior webs conspicuously margined with white. The upper surface of the tail is of a bluish-gray at the base, passing gradually into black towards the tip. The legs and feet are purplish-red; the irides, yellowish-white.



THE PASSENGER PIGEON.

THE PASSENGER PIGEON.*

WILSON'S account of this remarkable bird is very graphic and striking, and to it we shall be indebted for our present description. Its roosting-places are always in the woods, which sometimes occupy a large extent of forest. When these birds have frequented one of those places for some time, the appearance it exhibits is surprising. The ground is covered to the depth of several inches with their dung; all the tender grass and underwood are destroyed; the surface is strewed with large limbs of trees, broken down by the weight of the birds collecting one above another; and the trees themselves, for thousands of acres, killed as completely as if girdled with an axe. The marks of their desolation remain for many years on the spot; and numerous places could be pointed out where, for several years after, scarcely a single vegetable made its appearance. When these roosts are first discovered, the inhabitants, from considerable distances, visit them in the night with guns, clubs, long poles, pots of sulphur, and various other engines of destruction. In a few hours they fill many sacks, and load horses with them. By the Indians, a pigeon-roost or breeding-place is considered an important source of national profit and dependence for that season, and all their active ingenuity is exercised on the occasion. The breeding-places differ from the roosting-places in their greater extent. In the western countries, as the states of Ohio, Kentucky, and Indiana, these are generally in back woods, and often extend in nearly a straight line across the country for a great way. Not far from Shelbyville, in the state of Kentucky, some years ago, there was one of these breeding-places, which stretched through the woods in nearly a north and south direction, was several miles in breadth, and was said to be upwards of forty miles in extent. In this tract almost every tree was furnished with nests, wherever the branches could accommodate them.

HEAD OF COLUMBA CORONATA.

The pigeons made their first appearance there about the 10th of April, and left it altogether with their young before the 25th of May. As soon as the young were fully grown, and before they left the nests, numerous parties of the inhabitants, from all parts of the adjacent country, came with wagons, axes, beds, and cooking utensils; many of them accompanied by the greater part of their families, and encamped for several days at this immense nursery. Several of them stated that the noise was so great as to terrify their horses, and that it was difficult for any person to hear another speak without bawling in his ear. The ground was strewed with broken limbs of trees, eggs, and young squab pigeons, which had been precipitated from above, and on which herds of hogs were fattening. Hawks, buzzards, and eagles were sailing about in great numbers, and seizing the squabs from the nests at pleasure, while, from twenty feet upwards to the top of the trees, the view through the woods presented a perpetual tumult of crowding and fluttering multitudes of pigeons, their wings roaring like thunder, mingled with the frequent crash of falling timber: for now the axemen were at work cutting down those trees that seemed to be most crowded with nests, and contriving to fell them in such a manner, that in their descent they might bring down several others; by which means the falling of one large tree sometimes produced two hundred squabs, little inferior in size to the old ones, and almost one heap of fat. On some single trees upwards of one hundred nests were found, each containing one squab only—a circumstance in the history of this bird not generally known to naturalists. It was dangerous to walk under these flying and fluttering millions, from the frequent fall of large branches, broken down by the weight of the multitudes above, and which, in their descent, often destroyed numbers of the birds themselves; whilst the clothes of those engaged in traversing the woods were completely covered with the excrements of the pigeons. These circumstances were related to Wilson by many of the most respectable portion of the community in that quarter, and were confirmed in part by what he himself witnessed. "I passed," he says, "for several miles through this same breeding-place, where every tree was spotted with nests, the remains of those above described. In many instances I counted upwards of ninety nests on a single tree; but the pigeons had abandoned this place for another, sixty or eighty miles off, towards Green River, where they were said at that time to be equally numerous. From the great numbers that were constantly passing over our heads to and from that quarter, I had no doubt of the truth of this statement. The mast had been chiefly consumed in Kentucky; and the pigeons every morning, a little before sunrise, set out for the Indiana territory, the nearest part of which was about sixty miles distant. Many of these returned before ten o'clock, and the great body generally appeared on their return a little after noon. I had left the public road to visit the remains of the breeding-place near Shelbyville, and was traversing the woods with my gun on my way to Frankfort when, about ten o'clock, the pigeons which I had observed flying the greater part of the morning northerly, began to return in such immense numbers as I never before had witnessed.

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* Columba migratoria.

"Coming to an opening by the side of a creek called the Benson, where I had a more uninterrupted view, I was astonished at their appearance; they were flying with great steadiness and rapidity, and at a height beyond gun-shot, in several strata deep, and so close together that, could shot have reached them, one discharge could not have failed of bringing down several individuals. From right to left, as far as the eye could reach, the breadth of this vast procession extended, seeming everywhere equally crowded. Curious to determine how long this appearance would continue, I took out my watch to note the time, and sat down to observe them. It was then half-past one; I sat for more than an hour; but, instead of a diminution of this prodigious procession, it seemed rather to increase both in numbers and rapidity; and, anxious to reach Frankfort before night, I rose and went on. About four o'clock in the afternoon I crossed Kentucky river, at the town of Frankfort, at which time the living torrent above my head seemed as numerous and as extensive as ever. Long after this I observed them in large bodies that continued to pass for six or eight minutes, and these again were followed by other detached bodies, all moving in the same south-east direction till after six in the evening. The great breadth of front which this mighty multitude preserved would seem to intimate a corresponding breadth of their breeding-place, which, by several gentlemen, who had lately passed through part of it, was stated to me at several miles."

Wilson then enters into a rough calculation of the numbers of this mass, and he comes to the conclusion that its whole length was 240 miles, and that the numbers composing it amounted to 2,230,272,000 pigeons, observing that this is probably far below the actual amount. He adds, that allowing each pigeon to consume half a pint of food daily, the whole quantity would equal 17,424,000 bushels daily. Audubon confirms Wilson in every point, excepting that he very properly corrects that part of the narrative which would lead to the conclusion that a single one only is hatched each time. The latter observes, that the bird lays *two* eggs of a pure white, and that each brood generally consists of a male and female. "It is," he remarks, "extremely interesting to see flock after flock performing exactly the same evolutions which had been traced, as it were, in the air by a preceding flock. Thus, should a hawk have charged on a group at a certain spot, the angles, curves, and undulations that have been described by the birds in their efforts to escape from the dreaded talons of the plunderer, are undeviatingly followed by the next group that comes up. Should the bystander happen to witness one of these affrays, and, struck with the rapidity and elegance of the motions, feel desirous of seeing them repeated, his wishes will be gratified if he only remain in the place till the next group comes up."

THE CAPE TURTLE.*

This pretty species measures six inches, but the great length of the tail gives it an appearance of bulk which it does not really possess, as the body scarcely exceeds in size that of the common lark. Its wings are moderately long, and reach, when closed, to about the third of the length of the tail; the second quill-feather rather exceeds the first, and is the longest in the wing. The tail, like that of the passenger turtle, consists of twelve feathers, the tips of which are rounded, except the two middle ones, which are generally worn to a point. The bill is very slender, without emargination, and the upper mandible very gently deflected towards the tip. The tarsi and toes are short, the claws blunt and but little hooked, showing it to be partly ambulatory in its habits.

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* Columba Capensis: Auct.

As the name given to this bird implies, it is common around the Cape of Good Hope, and it is also met with in Senegal, Senegambia, and Nubia. Of its habits and manners we have no detailed account, except that it makes its nest in low trees and shrubs, and lays two white, pellucid-looking eggs, very fragile and easily broken. The male, of which we give an engraving, has the forehead, the region around the base of the bill, the chin, throat, and part of the breast, intense black. The colours of the female are more sordid.

THE CAPE TURTLE.

THE TURTLE-DOVE.*

In the male, the head and nape are of a vinous ash; on the sides of the neck there is a space composed of black feathers, terminated with white; the front of the neck, breast, and upper part of the belly, light vinous; the back brown-ash; the border of the wings bluish-ash; the other coverts rusty with a black spot at the centre of the feathers; the abdomen and lower parts of the tail pure white. The tail-feathers are blackish-ash; all, with the exception of the two intermediate ones, terminated with white; the lateral feather is white externally; the spaces round the eyes and the feet are red; the iris is a yellowish-red. The length of the bird is about eleven inches and a half. The female has not the white front, nor the colour of the wings so bright; her quills are brownish, whereas they are blackish in the males. Bechstein states that these birds are found throughout the temperate parts of Europe and Asia, and also in many parts of the South Sea Islands.

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* Turtur communis. Columba turtur.

The dove is associated with far-distant times, and particularly with the catastrophe of the Deluge. Thus it has been regarded by the Rev. W. L. Bowles, in strains of great sweetness :—

"Ride on :—the ark, majestic and alone
On the wide waste of the careering deep,
Its hull scarce peering through the night of clouds,
Is seen. But, lo! the mighty deep has shrunk!
The ark from its terrific voyage rests
On Ararat! the raven is sent forth,—
Send out the dove, and as her wings far off
Shine in the light, that streaks the severing clouds,
Bid her speed on, and greet her with a song:—

"'Go, beautiful and gentle dove,—
But whither wilt thou go?
For though the clouds ride high above,
How sad and waste is all below!'

"The wife of Shem, a moment to her breast
Held the poor bird and kissed it. Many a night,
When she was listening to the hollow wind
She press'd it to her bosom, with a tear;
And when it murmur'd in her hand, forgot
The long, loud tumult of the storm without.
She kisses it, and, at her father's word,
Bids it go forth.

"The dove flies on! In lonely flight
She flies from dawn to dark;
And now, amid the gloom of night,
Comes weary to the ark.

"'Oh, let me in,'—she seems to say,
'For long and lone has been my way;
Oh! once more, gentle mistress, let me rest,
And dry my dripping plumage on thy breast.'

"So the bird flew to her who cherished it.
She sent it forth again out of the ark;
Again it came at evening fall, and, lo!
An olive-leaf pluck'd off, and in its bill.
And Shem's wife took the green leaf from its bill,
And kiss'd its wings again, and smilingly
Dropp'd on its neck one silent tear for joy.
She sent it forth once more, and watched its flight,
Till it was lost amid the clouds of heaven;
Then, gazing on the clouds where it was lost,
Its mournful mistress sung this last farewell :—

"'Go, beautiful and gentle dove,
And greet the morning ray;
For, lo! the sun shines bright above,
And night and storm are passed away:

"'No longer drooping, here confined,
In this cold prison dwell;
Go, free to sunshine and to wind,
Sweet bird, go forth, and fare-thee-well.

"'Oh! beautiful and gentle dove,
Thy welcome sad will be,
When thou shalt hear no voice of love
In murmurs from the leafy tree:

"Yet freedom, freedom shalt thou find,
From this cold prison cell;
Go, then, to sunshine and to wind,
Sweet bird, go forth, and fare-thee-well.'"

THE GALEATED CURASSOW.

Many of our varieties of pigeons are very beautiful, and they all present peculiarities of manner and flight, well known to those who take pleasure in these birds. The *tumbler* is remarkable for flying in circles, and throwing itself over backwards, so as to perform a somersault in the air; this evolution is often performed several times in succession before settling. The *fantail* has sixteen or eighteen tail-feathers, and it is distinguished by their being peculiarly arranged, like those of a fowl. This variety is usually white. The *pouter* is conspicuous, though not elegant, from its elevated figure, feathered legs, and distended crop. The *jacobin* is a small pigeon, commonly of a rusty-yellow, with a frill of reverted feathers down each side of the neck to the chest. The *nun* is a beautiful variety, of a pure white, excepting the head, quill feathers, and tail, which are black.

Sir E. Tennent describes a pigeon, called by the natives of Ceylon *Neela-cobeya*,* strikingly elegant in shape and colour, as very remarkable for the singularly soothing effect of its low and harmonious voice. "A gentleman," he says, "who has spent many years in the jungle, in writing to me of this bird, and of the effects of its melodious song, says, that 'its soft and melancholy notes, as they came from some solitary place in the forest, were the most gentle sounds I ever listened to.' Some sentimental smokers assert that the influence of the propensity is to make them feel *as if they could freely forgive all who had ever offended them;* and I can say, with truth, such has been the effect on my own nerves of the plaintive murmurs of the neela-cobeya, that sometimes, when irritated, and not without reason, by the perverseness of some of my native followers, the feeling has almost instantly subsided into placidity on suddenly hearing the loving tones of these beautiful birds."

Another family has the following characters:—Three toes before, one behind, the latter touching the ground throughout. The head feathered, generally crested; and there is often a cere or naked skin, at the base of the bill. Of this family the following is an example:—

THE GALEATED CURASSOW.†

A PROTUBERANCE may be observed rising from the upper mandible of this bird, with the base of which it is continuous. When fully developed, it is more than two inches long, and of a livid slate-colour. Externally it is hard and bony, but internally it is cellular—the cells communicating with the cavity of the mouth. It is much larger in the male than in the female.

These birds are natives of Mexico. Their head and neck are covered with short, black, velvety feathers, and the remainder of the plumage is of a brilliant black, exhibiting, in certain lights, a tinge of green, with the exception of the abdomen and under tail-coverts, which are white.

They live in large bands, commonly building their nests on the ground, but perching on trees. Like the hen pheasant, or the common hen, the females lead their young about in search of food, which consists at first of worms and insects, and to these are afterwards added fruits and seeds.

THE PEACOCK.‡

THE Peacock, belonging to another family,§ was originally brought from India, and thence into Persia and Media. Aristophanes mentions "Persian peacocks," and Suidas calls the peacock "the Median bird." In the Scriptures it is enumerated among the costly articles imported by the ships of Tarshish, employed by Solomon to enrich his country with the remarkable products of foreign nations. The fleet of the Hebrew monarch might easily procure it either from India or Persia. From Persia it was gradually diffused through India, Egypt, Greece, and Europe.

The cradle of the peacock has long since been determined. It is in the countries of Southern Asia and the vast archipelago of the Eastern Ocean that this bird appears to have fixed its dwelling, and to live in a state of freedom. Such is the testimony of numerous travellers who are worthy of implicit confidence. The chase of the peacock is well known to form one of the chief amusements in Bengal, and in the islands of Java and Sumatra; but this is a somewhat dangerous sport, as the proximity of the tiger in those places where the peacocks most abound obliges the hunter to use much circumspection, for this dreaded beast of prey shows a peculiar predilection for the flesh of these birds.

Colonel Williamson, in his account of peacock shooting, states that he had seen, about the passes of the Jungletery district, surprising quantities of wild pea-fowls. Whole woods were covered with their beautiful plumage, to which the rising sun imparted additional brilliancy. Small patches of plain among the long grass, most of them cultivated, and with mustard then in bloom, which induced the birds to feed, increased the beauty of the scene. "I speak within bounds," continues the Colonel,

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* Chalcophaps Indicus: Linnæus.

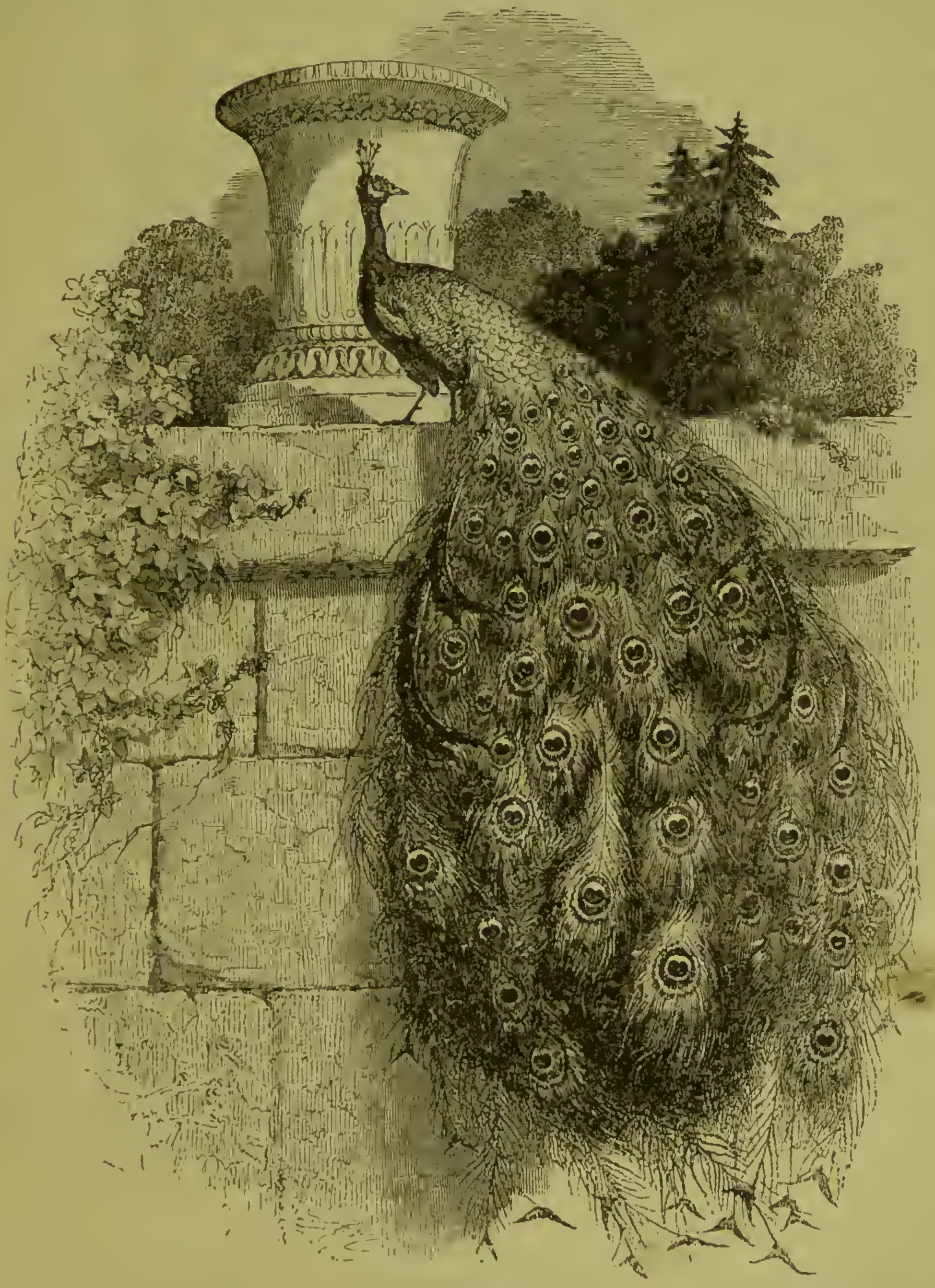
† Ourax pauxi: Cuvier.

‡ Pavo cristatus.

§ Pavonidæ.

"when I assert that there could not be less than twelve or fifteen hundred pea-fowls, of various sizes, within sight of the spot where I stood for near an hour."

According to the same authority, it is easy to get a shot in a jungle; but when the birds flock together—which they do to the amount of forty or fifty—there was greater difficulty. Then they are not easily raised, and run very fast—so fast, indeed, that the Colonel doubts whether a slow spaniel could make them take wing. They fly heavy and strong, generally within an easy shot; if winged only, they usually escape, from their swiftness of foot. They roost on high trees, into which they fly towards dusk.



THE PEACOCK.

M. Temminck had an opportunity of examining two males of the wild peacock: these birds resembled each other perfectly, and were as familiar as the domestic peacocks. In brilliancy of plumage the wild peacock stands unrivalled among the feathered race. In his incomparable robe we find united all the brilliant colours which we admire separately in other birds—all that glistens in the rainbow, and sparkles in the mine—the azure tints of the sky, and the richest emerald of the fields.

The wild peacock is almost the size of a hen-turkey. The length from the end of the bill to the extremity of the tail is four feet five inches; the tail alone is nineteen inches. It is the richly-assorted colours of the alar-coverts that constitute one of the principal differences between this bird and the domestic peacock. The wild pea-hen has but one brood in the year; she lays from twenty-five to thirty eggs, which she deposits on the ground in well-sheltered places, where they are secure from the assaults of the tiger.

If the empire of the feathered tribes were claimed by beauty, and not by power, the peacock would be regarded by the multitude as the king of birds. The elegance of its form, and the brilliancy of its plumage, are exceeded by none of the feathered race. Its large size, imposing manner, firm tread, and noble figure; the rich crest upon its head adorned with the most brilliant colours; its matchless plumage, appearing to combine everything that can delight the eye—all unite to give it a peculiarly distinguished place. The Romans were well acquainted with this gorgeous bird. It was called the "Bird of Juno" by the poets, who feigned that with the eyes of Argus she adorned its tail, and thus bestudded it with gems—"*et gemmis caudam stellantibus implet.*"

The peacocks constitute the great ornament of menageries. During summer they are fond of living in an extensive space, where they can choose elevated situations for perching. But in winter it is necessary to place them under shelter against the inclemency of the weather. The preferable habitation for them is one in which they can perch. The season of reproduction with the peacocks commences at the end of March or the beginning of April. There is an interval of one day between the laying of each egg. When they are taken away, according as they have been laid, the entire brood will amount to eight or twelve. The eggs are of the bulk and form of goose-eggs, of a fulvous white, with spots or points of a deeper hue. The pea-hens are not very assiduous in hatching, and often quit their eggs to fly to some elevated place. The young pea-chicks rarely follow the mother to elevated situations until four weeks have elapsed. About this time the aigrette begins to appear.

Until the second year the male and female have the same plumage. In the third year, the long dorsal plumes of the male begin to appear, and it is then that these birds begin to whirl about the tail, and to court the attention of the females. The pea-hen does not begin to lay till the third year. From the small extent of the wings, it would appear that the flight of the peacocks must be low and heavy; still they can make tolerably long passages in the air. Ælian extends their life to one hundred years —an opinion to which Willughby assents—but it does not continue more than a quarter of that space.

THE CHINESE PEACOCK PHEASANT.

THE peacocks are valued in all countries where they are known for their beauty. Thus, they are great favourites in Persia, and are more common there than in England as an ornament in grounds and gardens. The King of Persia has a throne which is called "the throne of the peacock," from two representations of peacocks, which are placed on square pillars on each side of the seat. These sculptured birds are studded with precious stones, and each of them holds a large ruby in its beak. In China, beautiful fire-screens, and other ornamental articles, are made of peacocks' feathers, tastefully arranged, and mounted on ivory handles. Many Hindoo temples in the Dukhun have considerable flocks of peacocks. On comparison with the bird domesticated in Europe, the latter is found, both male and female, to be absolutely identical with the wild bird of India. Solomon, doubtless, constituted the peacock one of the ornaments of his pleasure-gardens. It was introduced into ancient Greece at a date far anterior to the time of Aristotle,, who was born nearly four hundred years before the Christian era, that philosopher speaking of it as well known. It is also mentioned by Aristophanes, the celebrated comic poet of Greece, whose birth preceded that of Aristotle.

The Black-shouldered Peacock,* commonly called the Japan Peacock, has no such origin, and may prove to be a variety of the common peacock. The Javan Peacock,† points out the island from whence it is derived: it is found also in the Malay peninsula.

On the borders, if we may so speak, of the genus of peacocks, we find the bird of which our engraving is an accurate representation. The name given to it by Edwards sufficiently indicates its general character. This bird does not elevate its tail like the peacocks. It has neither the large dorsal plumes, nor the plumes of the tail, with which the peacock forms his wheel. Its tail is of a totally different form, not only from that of the peacock and the pheasant, but from that of all the gallinæ. It is formed of two ranges or tiers of feathers, the upper range lying over the lower, which is the true tail. This bird differs again from the pheasant by having a broad and rounded tail, the feathers of which are not vaulted like those of the true pheasants; and also in its cheeks, which are not covered with a tissue of velvety red. The character of its having constantly several spurs also removes it from the peacocks and pheasants.

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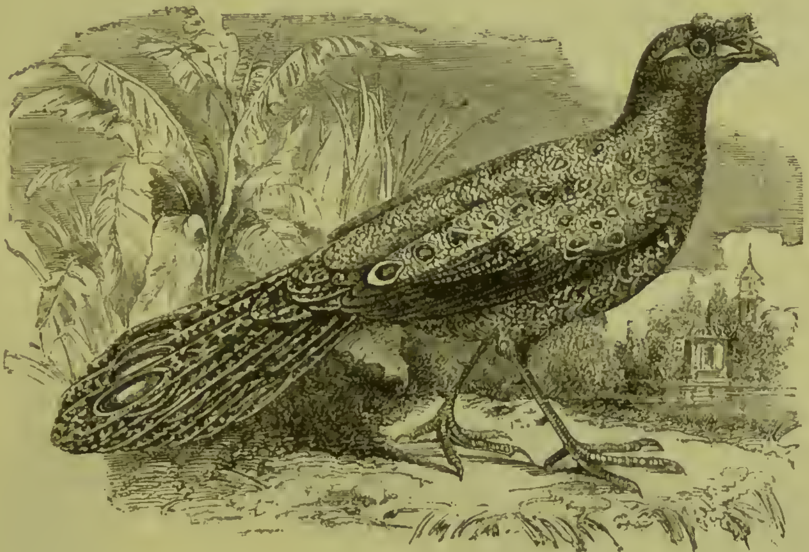
* Pavo cristatus.

† Pavo spicifer



THE CHINESE PEACOCK PHEASANT.

This beautiful form was raised to the rank of a genus by M. Temminck. Cuvier placed it among the peacocks properly so called; but other species have since been discovered, which, throwing further light on the modifications of form, will justify its genuine separation.

Under the same name* are placed the Turkeys.

THE WILD TURKEY.†

Much has been written, and more thought, as to the origin of these birds. "In England," says Willughby, "they are called turkeys, because they are supposed to have been first brought to us out of Turkey." Ray, his friend and companion in science, however, knew better. In a "Perfect Description of Virginia," now some two hundred years old, we read that the colonists there have "wilde turkies, some weighing sixtie pound weight." And to that country we must assuredly look as the one from whence we derived the domestic bird. When, however, the couplet is cited—

> "Turkeys, carps, hoppes, piccarel, and beer,
> Came into England all in one year,"

we confess we are not prepared to give it credence.

The head of the wild male is small in proportion to the body; it is covered with a naked bluish skin, continued over the upper half of the neck, and uneven with warty elevations, changeable red on the upper portion and whitish below, and interspersed with a few scattered black hairs. The flaccid and membraneous naked skin, also changeable on the lower part of the neck, extends downwards into large wattles. A wrinkled conical fleshy protuberance, capable of elongation, and with a pencil of hairs at the tip, takes its rise from the base of the bill, where the latter joins the front. When this excrescence is elongated under excitement, it covers the bill, and extends several inches below it. A tuft of long rigid black hair springs from the lower part of the neck at its junction with the breast, shooting out among the plumage to the length of nine inches.

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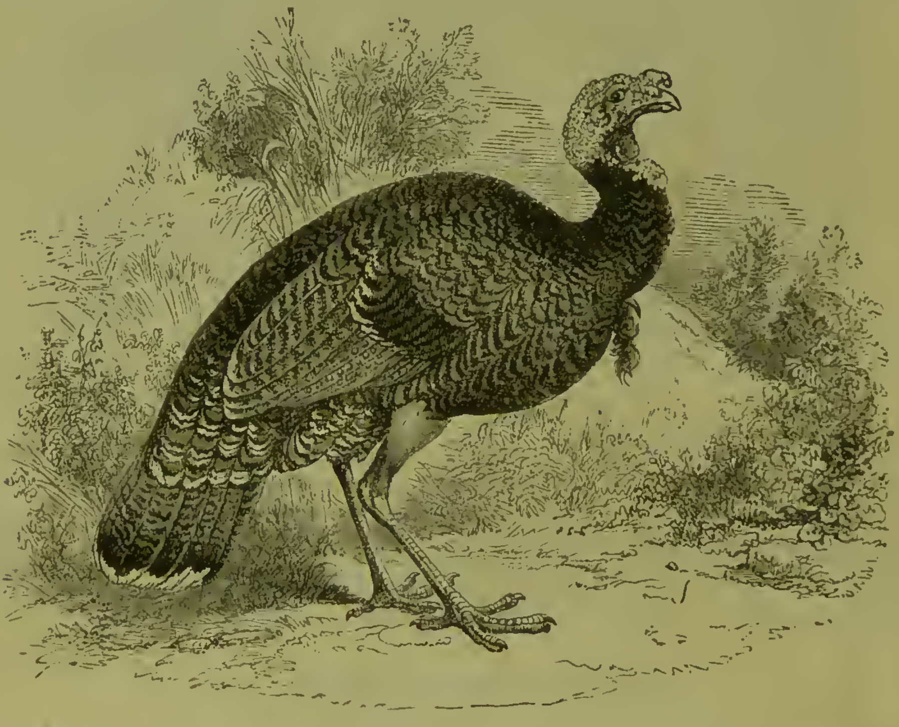
* Pavonidæ.

† Meleagris gallo-pavo: Linnæus.

The base of the feathers of the body, which are long and truncated, consist of a light fuliginous down; this part of the feather is succeeded by a dusky portion, which is again followed by a broad shining metallic band, varying from copper colour, or bronze, to violet, or purple, according to the play of the light; and the tip is a broad velvety band; but the last is absent in the feathers of the neck and breast.

The general plumage presents a glancing metallic lustre, which is, however, least glossy on the lower part of the back and tail-coverts. The wings are concave and rounded, not extending much, if at all, beyond the base of the tail. The tail is, at least, fifteen inches in length, rounded at the extremity; the feathers are eighteen inches broad, and capable of expansion and elevation with a fan-shape. The general colour of these feathers is brown mottled with black, crossed by numerous narrow undulating lines of the same. The bird stands high on its robust red legs, the scales of which have blackish margins; and the blunt spurs are about an inch long. The bill is reddish, but brown-coloured at the tip. The length of the bird is nearly four feet; the expanse of the wings more than five.



THE WILD TURKEY.

The female wild turkey has less of naked skin on the head and neck; they are partially covered with dirty feathers. The short caruncle on the front is incapable of elongation; and the tuft on the breast, which is not present in young birds, is in the older ones highly developed. The whole plumage is much more sombre than that of the male; but the colour of the tail is much the same. The length of the bird does not exceed three feet and a quarter.

THE DOMESTIC TURKEY.

In a domesticated state the plumage of the turkey varies as much or more than it does in the common poultry. White is far from uncommon; buff is more rare. But the most curious variety is that mentioned by M. Temminck, which was in Madame Backer's aviary at the Hague. This bird had a top-knot springing from the crown of the head; and a flock of a pale reddish tint, with an ample crest of pure white, were reared by the same lady. The disposition of the female is, generally, much more mild and gentle than that of the male.

The author of "Tabella Cibaria" says that the bird is "so stupid or timorous, that if you balance a bit of straw on his head, or draw a line of chalk on the ground from his beak, he fancies himself so loaded, or so bound, that he will remain in the same position till hunger forces him to move. We made the experiment." To this statement Mr. Broderip adds: "We never did, but we doubt it not, though we cannot accept it as a proof of stupidity. How much wit may be necessary to balance a straw may be doubtful; but gallant chanticleer has never been charged either with fear or folly, and yet you have only to take him from his perch, place him on the table by candlelight, hold his beak down to the table, and draw a line with chalk from it, so as to catch his eye, and there the bird will remain spell-bound, till a bystander rubbing out the line, or diverting his attention from it, breaks the charm. Many a fowl have we thus fascinated in our boyish days."

Gay, long since, in the name of this part of the feathered race, poured forth this piteous lamentation:—

"Man, cursed man, on turkeys preys,
And Christmas shortens all our days.
Sometimes with oysters we combine,
Sometimes assist the sav'ry chine;
From the low peasant to the lord,
The turkey smokes on every board."

The complaint of this bird may still be uttered; for so far from the ravages on its race being diminished, they must rather be greatly increased since the time when the poet gave it utterance. A visit to Leadenhall Market, just before Christmas, would astonish any of our readers who have not yet looked on its multitude of turkeys.

THE TALEGALLA, OR BRUSH TURKEY.*

A VERY remarkable bird was originally described by Latham under the name of the New Holland vulture; but subsequently he removed it from the vultures, and placed it among the birds of the gallinaceous order, to which it really belongs.

The Brush Turkey, or, as Mr. Gould terms it, the Wattled Talegalla, inhabits various districts of New South Wales, from Cape Howe on the south to Moreton Bay on the north. In some places where it was once common, it has now become rare; and we learn that the cedar-cutters, and others, who are in the constant habit of hunting through the brushes of Illawara and Maitland, have nearly extirpated it from these localities. It is, however, still abundant in the dense brushes of the Manning and Clarence, and along the sides of the lower hills that branch off from the great range into the interior; on the Brezi range to the north of the Liverpool plains, and also on the hills on each side of the Samoi.

In its habits, the brush turkey is gregarious, associating in small flocks, which wander among the dense covert of the brushwood; and it is shy and distrustful. It runs with great facility, and, from the nature of the localities it frequents, easily eludes pursuit. One of its greatest enemies is the dingo, or wild dog; and when hard pressed by this ferocious beast of prey, it springs to the lower branch of a tree, and, by a succession of leaps from branch to branch, ascends to the top. The whole flock act in concert, and, having ascended as high as they can, they either remain perched in security, or fly to a distant spot, where the tangled brushwood promises a more effectual concealment. They are also in the habit of resorting to the branches of trees, as a shelter from the mid-day sun; and while thus reposing, they offer a sure mark to the sportsman, who may kill the whole flock, for they will allow a succession of shots to be fired without moving, or being roused from their lethargy. It is by taking advantage of their mid-day repose that the colonists destroy them in great numbers for the sake of their flesh, which is extremely delicate and tender, and is consequently in high esteem.

While wandering through the brush, these birds utter a clucking noise; their food consists principally of berries and various seeds; and, like our common poultry, they dust themselves in the soft ground, making bare depressions in the spots which they frequent.

The most interesting and remarkable circumstance connected with the economy of the brush turkey is, that it does not hatch its eggs by incubation; it does not sit upon them like other birds, not even occasionally, or during the night, but forms for them an "eccaleobion," in which they are hatched without the weary duties to which other birds are called by the laws of Nature. "The brush turkey," says Mr. Gould, "collects together an immense heap of decaying vegetable matter, as a depository for the eggs, and trusts to the heat engendered by the process of decomposition for the development of the young. The heap employed for this purpose is collected by the birds during several weeks previous to the period of laying; it varies in size from two to four cart-loads, and is of a perfectly pyramidal form. The construction of the work is not the task of one pair of birds, but is effected by the united labours of several; the same site appears to me, from the great size, and the entire decomposition of the lower part, to be resorted to for several years in succession, the birds adding a fresh supply of materials previously to laying.

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* Talegalla Lathami: Gould.

"The mode in which the materials composing these mounds are accumulated is equally singular; the bird never using its beak, but always grasping a quantity in its foot, throwing it backwards to one common centre, and thus clearing the surface of the ground for a considerable distance so completely, that scarcely a leaf or a blade of grass is left.

"The heap being accumulated, and time allowed for a sufficient heat to be engendered, the eggs are deposited, not side by side, as is ordinarily the case, but planted at the distance of nine to twelve inches from each other, and buried at nearly an arm's depth, perfectly upright, with the large end upwards. They are covered up as they are laid, and allowed to remain until hatched. I have been credibly informed, both by natives and settlers living near their haunts, that it is not unusual to obtain nearly a bushel of eggs at one time from a single heap; and as they are delicious eating, they are eagerly sought after."

Some of the natives assured Mr. Gould that the females are constantly in the neighbourhood of the heap, waiting for the time at which the hatching of the eggs takes place; and that they frequently uncover and cover again the eggs, as if for the purpose of ascertaining their progress, or of assisting the young to liberate themselves from their imprisonment. Others, however, denied this, and stated that the eggs were altogether forsaken, the young being left to liberate themselves. Unfortunately, Mr. Gould was not in the districts inhabited by these birds during the breeding season; but he inclines to the latter statement, and thinks that, from the great size of the egg, there is room for the young to become more fully developed than in ordinary cases, and that they are hatched capable of taking care of themselves. In confirmation of this, he observes that, in searching for eggs in one of the mounds, he discovered the remains of a young bird, apparently just escaped from the shell. It was clothed, not with down, as is usual, but with feathers—a proof, if indeed the bird died when just escaped from the shell, that it was more advanced than is the young of the common fowl, or any kind of poultry, at the same crisis.

Mr. Gould also thinks the opinion that the eggs, once deposited, are never disturbed afterwards, to be corroborated by the fact that they are always found upright. But it may here be remarked, that though the parent birds may occasionally uncover the eggs, it does not follow that they alter the position of them. Nor is the discovery of a young bird feathered, which appeared as if newly hatched, a proof either that the parents neglect the eggs or the young. These points yet remain to be determined.

Mr. Gould saw several of the mounds formed by these birds, both in the interior of the country and at Illawara. "In every instance, they were placed in the most retired and shady glens, and on the slope of a hill." The ground above the nest was always scratched clean, while that below the nest appeared to be untouched; as if the birds had found it more convenient to bring the materials for its construction down the hill, than to throw them up.

The eggs are perfectly white, of a long, oval figure, and three inches and three quarters in length.

The wattled talegalla is about the size of a common turkey, three parts grown. The adults have the whole of the upper surface of a blackish brown. The feathers of the chest are edged with silvery gray. The skin of the head and neck is of a deep red, and thinly sprinkled with short hair-like feathers; the sides of the neck, at its lower part, are ornamented with a bright yellow wattle, or fleshy excrescence, capable of being expanded or contracted at will, as in the common turkey. The female is rather less than the male, and the wattles are not so much developed; her colour is the same. One of the inclosures of the Zoological Gardens is appropriated to this very remarkable bird.

THE GUINEA-FOWL* AND OTHER GALLINÆ.

The Pintado is the bird formerly known to the ancients under the name of Meleagris, or Numidian Fowl. The common name employed in this country is the Guinea-Fowl. The wild birds inhabit the western coasts of Africa, and principally towards the south, from the Cape of Good Hope as far as the coast of Guinea. Many broods unite together, forming a large flock, flying in bands, and returning at fixed hours to the springs or neighbouring rivers to drink. At sunset they retire into the woods, and perch themselves on trees to pass the night.

In the poultry-yard they pursue all the species of fowl with which they happen to be placed, and maintain with them an obstinate and continual war. They are lively, restless, and impetuous. M. Temminck frequently and vainly tried to make them mix with the pheasants in the woods, but always without success. The pheasants invariably gave way to these new and troublesome guests, and sometimes they would quit the neighbourhood altogether. The pintados are clamorous and troublesome birds. Their monotonous and disagreeable cry has been compared to a door grating on rusty hinges. It may be represented by the syllables *ceuk, ceuk*, pronounced forcibly, and with a rough voice. When this wretched noise becomes wearisome to themselves, they then change it for a little cry which may be indicated by the syllables *chi-wi*.

The female lays usually at the end of May, or in the early days of June, and the eggs are generally from sixteen to twenty-four in number. The shell is very hard, of a yellowish white, spotted with small brown points. They are deposited in a retired place under some bush. The incubation lasts three weeks and four days. The female seldom sits with any assiduity, nor when the young are disclosed does she display for them any great affection. The casque on the top of the head, and the barbles of the lower jaw, are not to be distinguished before the birds are six months old.

Some of the members of another family† are equally familiar with several of those just noticed. To adopt the words of Buffon: "It is sufficient to name the pheasant to remind us of the place of its origin. The pheasant—that is, the bird of the Phasis—was, it is said, exclusively confined to Colchis before the expedition of the Argonauts: those Greeks, ascending the Phasis, to arrive at Colchi, beheld these fine birds spread along the banks of the river; and by bringing them back to their own country, bestowed upon it a gift more precious than the golden fleece. At the present day, the pheasants of Colchis, or Mingulia, and some other of the neighbouring countries, are the finest and largest in the known world."

From these countries they have been extended in almost all the regions of the known world. They are found in the greater part of Europe; they are very abundant in Spain, in Italy, in some parts of Germany, particularly in Bohemia, and in the south of France. In the north they are less common. The common pheasant does not appear to inhabit Africa; but it is greatly multiplied in China, where it lives in the woods, without mixing with the other species, which are also equally abundant in this vast empire. Pallas describes pheasants as found in Siberia. They are very common among the Kirghis, who ornament their bonnets with the plumes of this bird.

THE COMMON PHEASANT.‡

"Close by the borders of the fringed lake,
And on the oak's expanded bough, is seen,
What time the leaves the passing zephyrs shake,
And gently murmur through the sylvan scene,
The gaudy pheasant, rich with varying dyes,
That fade alternate, and alternate glow,
Receiving now his colours from the skies,
And now reflecting back the watery bow.
He flaps his wings, erects his spotted crest;
His flaming eyes dart forth a piercing ray;
He swells the lovely plumage of his breast,
And glares a wonder of the orient day."

The generic character of the Common Pheasant has thus been given:—Bill of mean length, strong; upper mandible convex, naked at the base, and with the tip bent downwards. Nostrils basal, lateral, covered with a cartilaginous scale; cheeks and region of the eyes destitute of feathers, and covered with verrucose red skin. Wings short, the first quills equally narrowed towards their tips, the fourth and fifth the longest. Tail long, regularly wedge-shaped, and composed of eighteen feathers.

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* Numida Meleagris.

† Phasianidæ.

‡ Phasianus colchicus.

Feet, having three anterior toes united by a membrane as far as the first joint, and the hind toe articulated upon the tarsus, which in the male birds is furnished with a horny cone-shaped sharp spur.

Pheasants are fond of the shelter of thickets and woods, where the grass is long; yet, like partridges, they often breed also in clover fields. They form their nests on the ground, where from twelve to fifteen eggs are laid, smaller than those of the domestic hen. As in the mowing of clover near the woods frequented by pheasants the destruction of the eggs is sometimes very great, gamekeepers have had directions to hunt them from these fields as soon as they begin to lay, until their haunt is broken, and they retire into the corn.

THE COMMON PHEASANT.

THE RING-NECKED PHEASANT.*

The Ring-Pheasants are common in the woods of many parts of China. They are frequent in India, where they are smaller than the common pheasant. They are also found about the Caspian Sea, on the southern part of the desert between the Don and the Volga, in Great Tartary.

It is long since this bird was brought from China into Europe. Its size is always less, the expanse of its wings smaller, and its tail shorter, when it is compared with the common pheasant. The upper part of its head is tawny, with a gloss of green, two white dashes surmount the eyes, and the rest of the head and neck are of a deep and brilliant green, with a violet reflection, except where the white collar, which gives its name to the species, passes round the neck.

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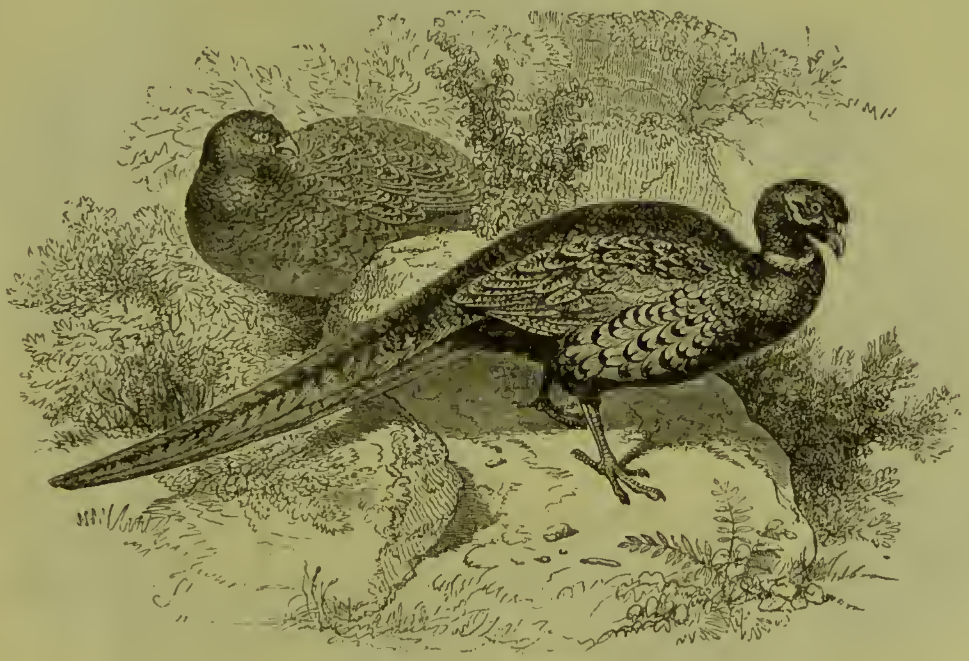
* Phasianus torquatus.

The feathers of the back are black in the middle, surrounded by a zig-zag whitish band, and tipped by a black arrow-shaped spot; those of the shoulders are black at the base, marked in the centre by a whitish pupil surrounded by a black ring, and chestnut with somewhat of a purplish gloss towards their tips. The tail-coverts are light green, with loose silky barbs; the breast of a brilliant reddish purple; the sides pale yellow; the under parts and thighs black, with a gloss of violet; and the tail-feathers olive-green in the middle, with broad black transverse bands.

M. Temminck considers the ring-necked pheasant of China not as a variety of the common species, but as one that is distinct. In its native country this bird never unites with the common pheasant. There is a constant and marked dissimilarity between the plumage of these two birds. Their manners are dissimilar, and their eggs of a different colour.



THE RING-NECKED PHEASANT.

In the female there is a narrow band of short black feathers beneath each eye, which distinguishes her from the common pheasant, from which she differs besides in the want of the black spots on the breast, and the greater intensity of the transverse black bars upon her tail.

The parent birds and their brood, if undisturbed, remain in the stubbles and hedge-rows for some time after the corn is ripe. If disturbed, they seek the woods, and only issue thence in the mornings and evenings to feed in the stubbles. They are fond of corn; but can procure a subsistence without it, since they often feed on acorns and on the wild berries of the woods. Often may it be said in the autumnal season :—

"See! from the brake the whirring pheasant springs,
And mounts exulting on triumphant wings;
Short is his joy; he feels the fiery wound,
Flutters in blood, and panting beats the ground.
Ah! what avail his glossy, varying dyes,
His purple crest, and scarlet-circled eyes;
The vivid green his shining plumes unfold,
His painted wings and breast that flames with gold!"*

In confinement, the female pheasant neither lays so many eggs, nor hatches and rears her brood with so much care and vigilance, as in the fields out of the observation of man. Indeed, she will very rarely dispose them in a nest, or sit upon them at all; and hence, in the business of incubation and rearing her young, the domestic hen has generally been substituted for the hen-pheasant.

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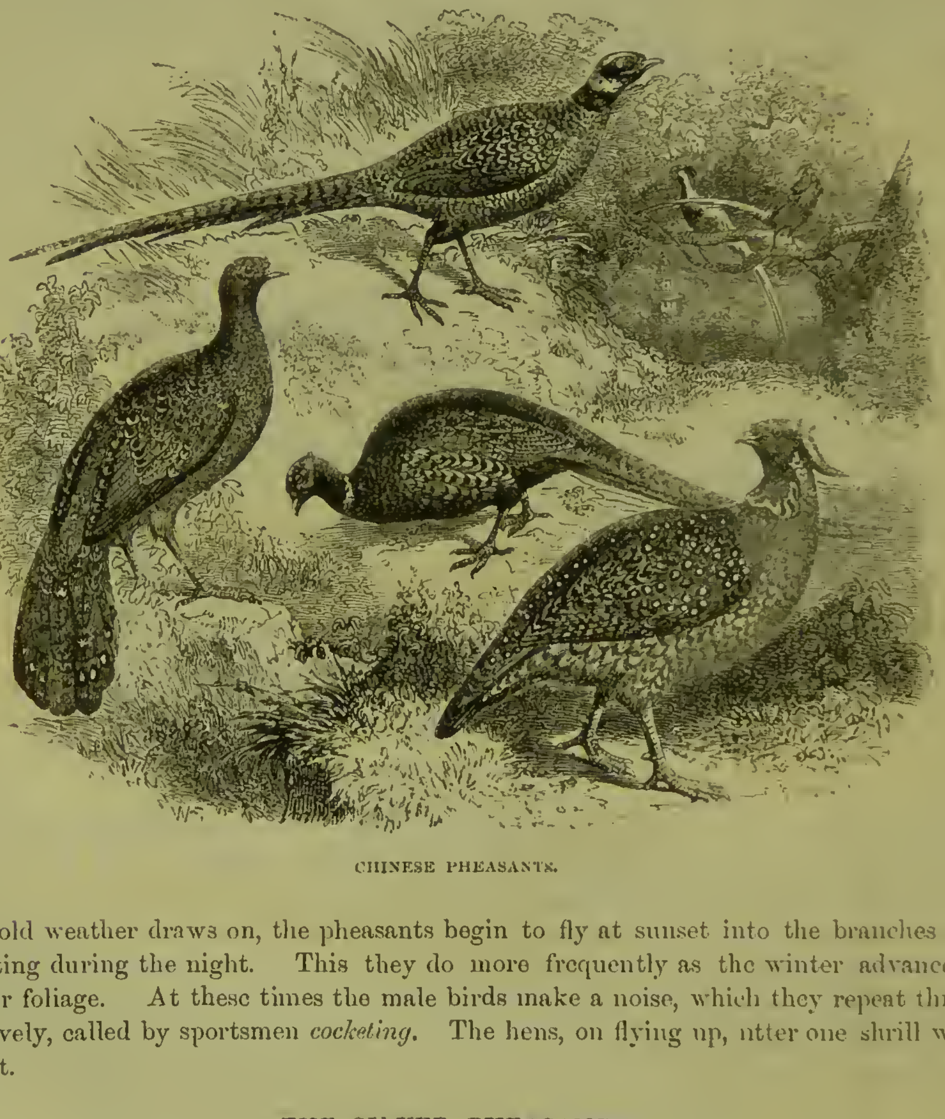
* Pope.

It has been supposed by some that this bird is by no means remarkable for sagacity. Thus, it has been asserted that the pheasant imagines itself out of danger whenever its head only is concealed; and that on being roused from its usual state, it will often perch on a neighbouring tree, where its attention will be so fixed on the dogs, as to suffer the sportsman to approach very near. But there are sportsmen who can recount stratagems that they have known old cock-pheasants to adopt in thick and extensive coverts, when they have found themselves pursued, before they could be compelled to take wing, which prove that this bird is not deficient in contrivances for its own preservation.



CHINESE PHEASANTS.

As the cold weather draws on, the pheasants begin to fly at sunset into the branches of the oak trees for roosting during the night. This they do more frequently as the winter advances, and the trees lose their foliage. At these times the male birds make a noise, which they repeat three or four times successively, called by sportsmen *cocketing.* The hens, on flying up, utter one shrill whistle, and then are silent.

THE SILVER PHEASANT.*

The Silver Pheasant, both in external form and natural disposition, exhibits much analogy with the birds of the genus *Gallus.* It is easily tamed, and might be entirely domesticated. Its robust constitution accords more with that of the common fowl than that of the other pheasants. The form of its caudal plumes, and the mode of their insertion, also, present great analogies to the domestic cock.

The total length of the male bird is about two feet eight inches. Its cheeks are clothed with an apparently naked skin of a bright red colour, advancing forwards above the eyes so as to form a kind of crest, and terminating in a pendulous fold on each side of the lower mandible. The top of the head is ornamented by a tuft of long black feathers, which fall down over the upper part of the back of the neck. On the sides of the head and neck, the entire surface of the back and wings, and the upper part of the tail, the plumage is of a bright silvery white, traversed with the greatest regularity by an infinite number of finely pencilled black lines passing obliquely, in the form of chevrons, across the feathers. A striking contrast to this delicacy of tint is afforded by the uniform purplish black of the fore part of the neck, breast, and under surface of the body.

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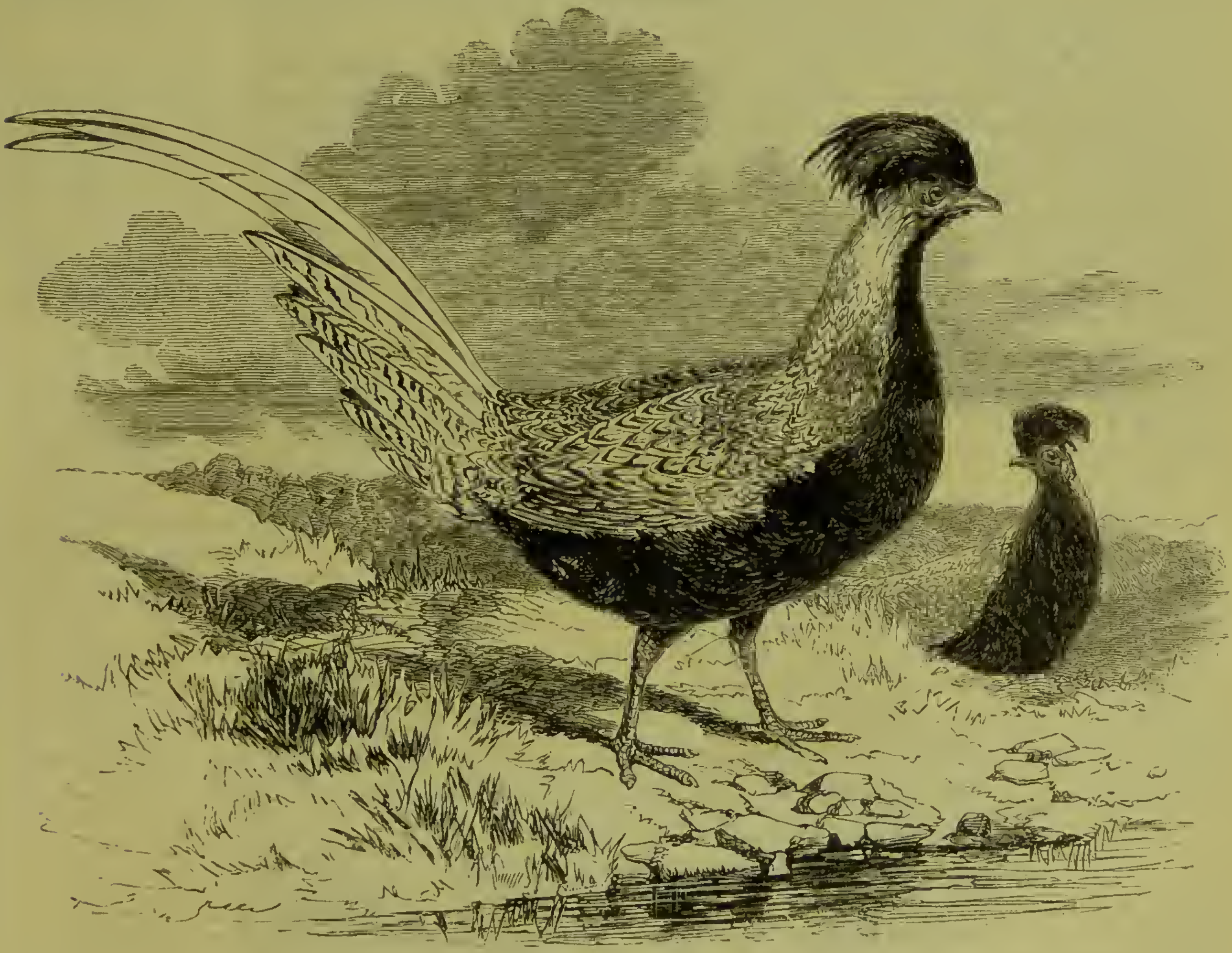
* Phasianus nytheremus: Linnæus.

In the female the red of the cheeks is much less extensive; the top of the head has a kind of crest of a dusky brown; the neck, breast, and upper surface are of an earthy brown, and crossed by blackish bands; and the tail variegated with black, white, and brown.



THE SILVER PHEASANT.

These birds pair about the end of April. When the female has sufficient liberty, she attends very assiduously to her brood. The incubation lasts twenty-six days. The number of the eggs varies from eight to fourteen. Their colour is yellowish-red, often bordering on black, and they have small brown points.

This pheasant inhabits the northern regions of the vast empire of China. It has been transplanted into almost all the countries of Europe, where, with a little care, it thrives perfectly well. It is more easily tamed than the common pheasant, and its young ones are reared with less difficulty.

THE GOLDEN PHEASANT.*

The Golden Pheasant is derived from China. Its name there is said by Latham to be "Kinki," or

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* Phasianus pictus: Linnæus.

"Kinker," which signifies "Golden-flower Fowl." It is a favourite in that country, as may be seen by its frequent occurrence in Chinese paintings.

In our country this bird has hitherto been preserved only in aviaries, where it is shielded from the cold of winter and supplied with food. In captivity it breeds freely. It is one of a race remarkable for beauty.

The golden pheasant is much smaller than the common one. The length of the male is about three feet, of which the tail measures twenty-three inches. The head is ornamented with a beautiful silky crest, of a fine amber-yellow. The feathers of the back of the head and neck are of a rich orange-red, edged with a line of black, and capable of being raised at will. Lower down, so as to lie on the top of the back, the feathers are glossy greenish-black. The back is rich yellow; the wings deep blue at their base, the under surface intense scarlet.

It is chiefly the want of the comb, the peculiar covering of the cheeks, and the remarkable form of the tail, that distinguish the present group from the genus *Gallus*, comprehending the numerous species and varieties of domesticated fowls. From this hardy race the pheasants differ still more in constitution and habits than in external characters, seldom breeding in captivity, unless under the most favourable circumstances, and manifesting an excessive sensibility to the impressions of a variable atmosphere and the influence of a northern climate. The usual attitudes of the birds are extremely different—the cock elevating his head to the full stretch of his neck, with a haughty and independent air; while the pheasant projects it forwards in an almost horizontal position, scarcely raising it above the level of his body.

In the female, as is usual in this tribe of birds, the colours are far less splendid than those of the male. The upper parts are of a rusty-brown, varying in intensity; the under surface is marked with spots of a deep brown on a lighter ground; the throat is nearly white; the wings are transversely barred with black; and the tail, which is considerably shorter than that of the male, is variegated like the wings.

Much of the difficulty, as well as much of the tenderness of constitution, manifested by these birds is attributed by M. Temminck to the close confinement in which they are usually kept, and to the very precautions which are taken to preserve them from the effects of cold. He advises that they should be gradually habituated, like the more common race, to the large pheasantries in which the latter are preserved, and doubts not that, as they multiplied under such circumstances, they would become more and more hardy, until at last they would be fully capable of supporting the cold of our northern winters. The experiment, he tells us, has already been made in Germany, where they have been kept at perfect liberty in an open pheasantry, in company with the common species, and suffered no greater inconvenience than the latter from the change of seasons.

THE ARGUS PHEASANT.*

OF all the *Gallinæ* there are none whose wings are so little adapted for flight as those of the Argus. The secondary quills of the male are, in fact, three times longer than the primary, which spread out broadly at their extremities, and altgether form a large, sweeping, fan-like plume. Each of these feathers is beautifully ornamented with a row of eyes down the web on the outer side of the shaft, and the rest of this vane is filled with lineal and oval spots of deep brown on a yellowish gray ground. Their stems are extremely weak, and they have no coverts. If we add to this the weight of the bird, and its broad tail, in the centre of which are implanted two great and broad feathers, which exceed the others by many feet, it will appear that the Argus is not only unique, but the only bird in which so remarkable a disproportion takes place.

The Argus runs more than it flies, and its legs being very long, render it well adapted for this motion. It is also assisted therein by the use of its wings. It does indeed sometimes rise from the ground, but its flight is short and heavy.

This bird inhabits Sumatra, and is equally found in the south of India. It is also said to have been observed in Chinese Tartary. It appears to be a bird of recluse habits, frequenting wooded mountains, and places remote from human habitations. In size it is little inferior to a turkey. Its voice is described as rather plaintive.

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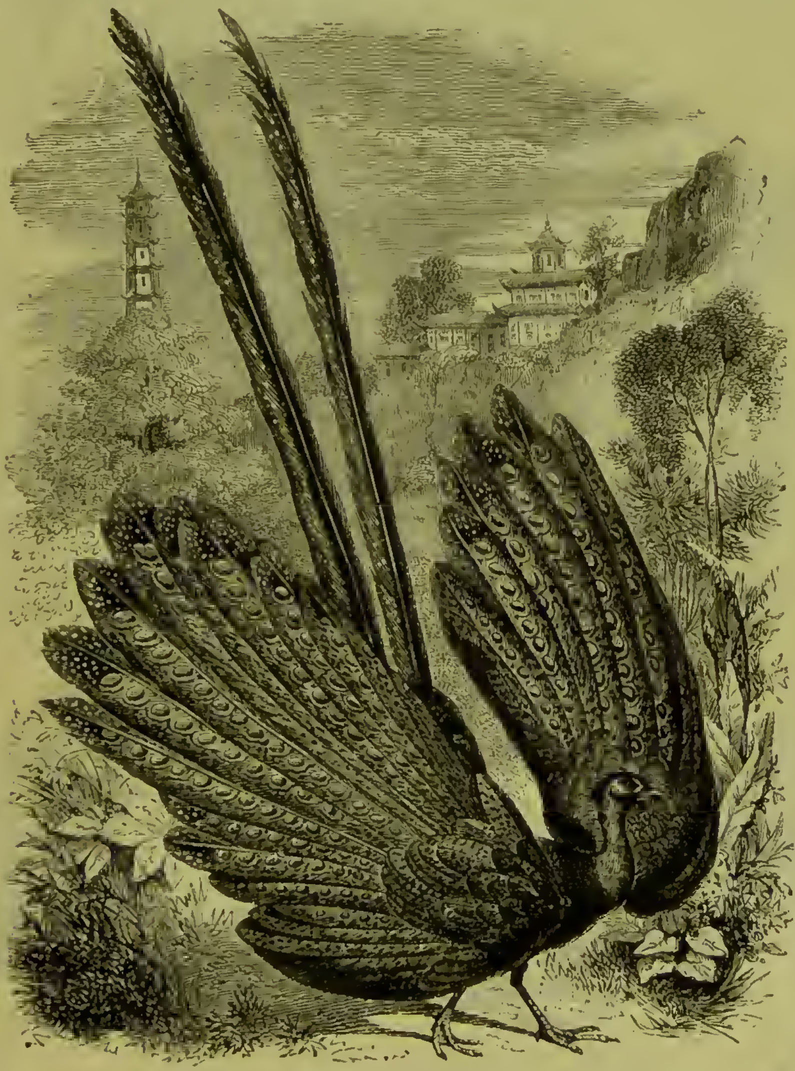
* Argus giganteus.

THE IMPEYAN PHEASANT.*

EXTREMELY difficult is it to form an adequate idea of this splendid bird, for the greater proportion of its plumage is dazzling with changing hues of green, steel-blue, violet, and golden-bronze. This pheasant looks as if it were principally clothed in a scale-armour of iridescent metal; while the plumage is soft and velvety to the touch. The crest on the head consists of naked-shafted feathers, with an oval tip of the same quality as the rest of the plumage, and of a metallic green; the centre of the back is pure white; the tail is rounded, and bright chestnut.



THE ARGUS PHEASANT.

This bird, the size of a hen-turkey, is a native of the mountain ranges of Nepaul and the Himalayas. Its principal food consists of bulbous roots, for scooping out which its bill is well adapted. Nothing seems certainly known of the rest of its habits.

THE JUNGLE FOWL.†

A RESTRICTED genus of these birds‡ is one of peculiar importance. The head of the birds constituting it is generally surmounted by a fleshy vertical crest, the base of the lower mandible furnished with two flattened wattles, and the tail-feathers, fourteen in number, rising in two almost upright planes, with ample coverts in the male sex. Here we find our domestic cock and hen.*

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* Lophophorus Impeyanus.—Phasianus Impeyanus: Latham. † Gallus giganteus: Temminck. ‡ Gallus.

Many fanciful and superstitious feelings are still retained regarding the domestic cock, and his nocturnal crowing; and even his more familiar morning salutation is supposed by the ignorant to dispel all spirits, "whether on sea or fire, in earth or air."

THE IMPEYAN PHEASANT.

"Some say that ever 'gainst that season comes
Wherein our Saviour's birth is celebrate,
The bird of dawning singeth all day long;
And then, they say, no spirit walks abroad;

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* Gallus domesticus.

The nights are wholesome; then no planets strike;
No fairy takes, no witch hath power to charm;
So hallowed and so gracious is the time."

Of the numerous benefits which the Divine goodness has enabled us to derive from the wide circle of the feathered tribes there is probably none which surpasses, either in extent or utility, the domestication of these most familiar birds. So long, however, have they been subservient to the subsistence and comfort of our race, that no authentic tradition remains of their introduction to any of the more ancient kingdoms of the earth. They may, therefore, be regarded as one of those particular and providential gifts which, at an early period of the world, was bestowed on the human family, and has since, like the faithful and accommodating dog, attended it in its wonderful and far-spread migrations.

THE JUNGLE FOWL.

It has been supposed, indeed, that our different races of domestic poultry were originally derived from Persia, from the circumstance of Aristophanes calling the cock "the Persian bird." But that this is erroneous is evident from the fact, that all modern researches have failed to discover any birds of the genus *gallus* in that country. If, however, it is merely meant that the Greeks, during their intercourse with the Persian nation, may have obtained from that people a breed previously domesticated, then there is reason for such an idea, poultry being known to have existed in Persia, in a domestic state, from a very remote antiquity.

No doubt can be entertained that these birds were well known over many parts of Europe and Asia for several hundred years before the Christian era. When Themistocles took the field to combat the Persians, he saw, it is said, two cocks fighting against each other; and hence he alluded, while haranguing his troops, to the invincible courage of these birds. "Observe," he said of the cock, "with what intrepid valour he fights, inspired by no other motive than the love of victory; whereas you have to contend for your religion and your liberty, for your wives and children, and for the tombs of your ancestors." Nor was this appeal uttered in vain: the Athenians achieved on this occasion one of the most memorable victories emblazoned on their annals. Themistocles died about the 449th year preceding the Christian era, and must, consequently, have been the contemporary of Nehemiah.

According to M. Temminck, our domestic cock seems to have originated from the Jago Cock,* a very large wild species, which inhabits the Island of Sumatra, and from the species *Bankiva*, another primitive cock, found in the forests of Java. For this opinion the following reasons have been assigned: the resemblance of their females to our domestic hens; the size of our village cock, which is intermediate, between that of the Jago and Bankiva; the nature of the feathers, and the forms and distribution of the barbs, which are absolutely the same as in the domestic cock; and because it is in those two species alone that the females are provided with a crest and small barbles, characters which are not found in any other of the primitive species which are known.

THE FRIZZLED AND SILKY FOWLS.

The Malay Gigantic Fowl is a native of Java and Sumatra. In its natural attitude the male bird is more than two feet in height, measuring from the top of the head to the ground. It has a comb, which is thick, low, and without serrations, appearing as if it had been partially cut off; the wattles are small; and the throat is bare. Elongated feathers, or hackles, of a pale golden-reddish colour, cover the neck, and advance upon the back; while others, of the same kind and hue, cover the rump, and drop on each side of the base of the tail. The feathers of the middle of the back and the shoulders of the wings, which are of a loose texture, are of a dark chestnut. The greater wing-coverts, like the tail-feathers, are of a glossy green. The limbs are remarkably stout. The tarsi are of a yellow colour. The voice of this bird differs greatly from the clarion-peal of our domestic fowl, for it is a sort of hoarse and short crow.

In some parts of continental India this bird is domesticated, and is known to Europeans as the

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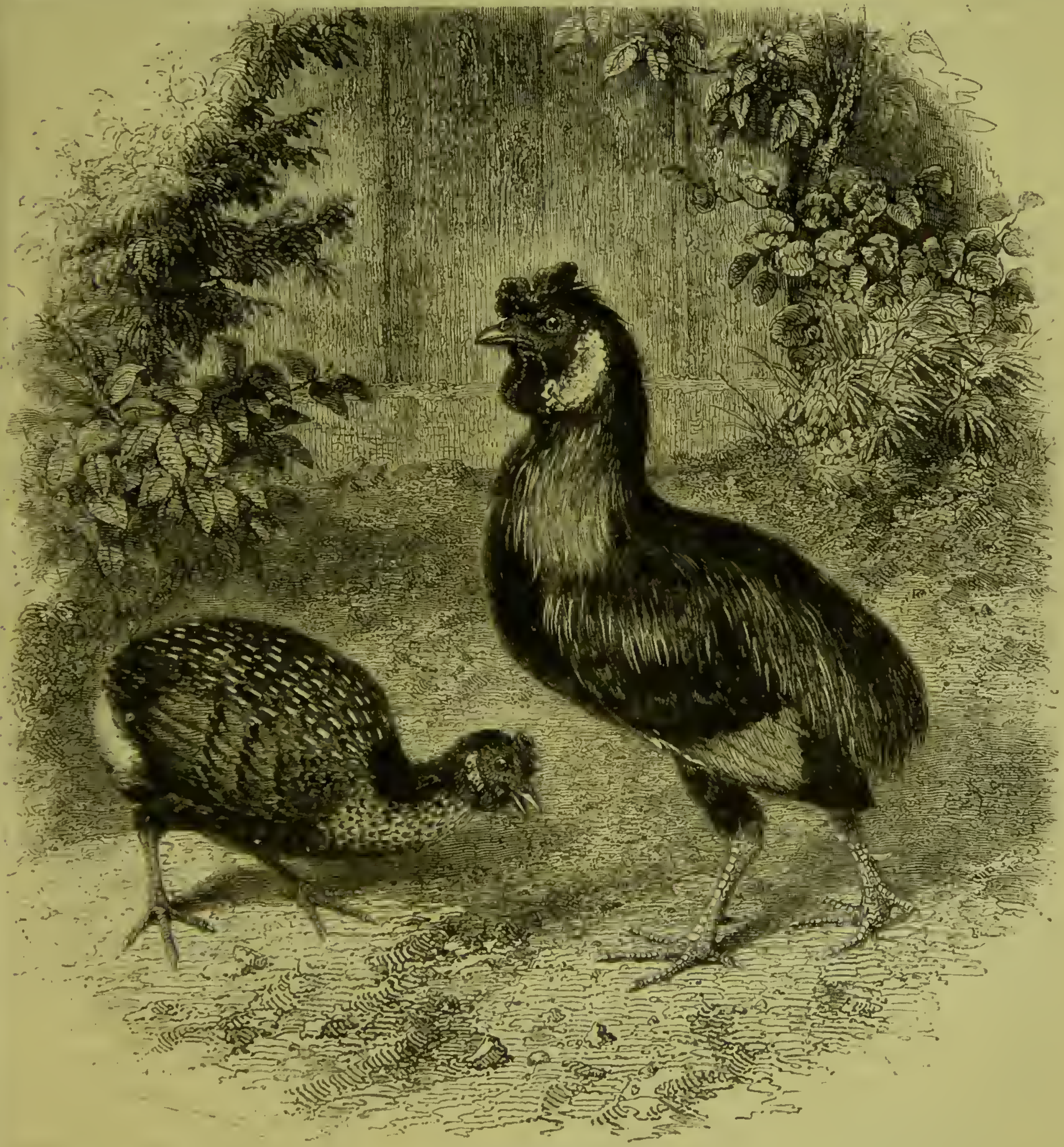
* Gallus giganteus.

Kulm Cock. Colonel Sykes supposes that it is not a native of that country, but that it was introduced by the Mussulmans from Java or Sumatra. Two cocks and a hen were brought by that gentleman into England in June, 1831. They bore the winter well; the hen laid freely, and soon reared two broods of chickens. The hen was one-third smaller than the male. The cock has the habit, when tired, of resting on the first joint of the leg. Other specimens of this gigantic race have been brought into this country.



WALLIKIKI POULTRY.

According to Sir E. Tennent, the Jungle-fowl of Ceylon* is shown by the peculiarity of its plumage to be distinct from the Indian species. It has never yet bred, nor survived long in captivity, and no living specimens have been successfully transmitted to Europe. It abounds in all parts of the island, but chiefly in the lower ranges of mountains; and one of Sir Emerson's most vivid memorials associated with his journey through the hills, is its loud, clear cry, that sounds like a person calling "George Joyce." At early morn it rises amidst mist and dew, giving life to the scenery that has scarcely yet been touched by the sunlight.

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* Chalcophaps Indicus.

The Domestic Cock is that bird over which, above all others, man has acquired the most ample dominion. This conquest was not, however, achieved without difficulty. In no work of antiquity do we meet with the slightest indication of the migration of these birds, nor is it probable that, heavy as they are, and with wings and tails so constructed as to have no facility for a flight of long duration, or for traversing the seas, they should have been able to transport themselves from countries far remote. Man must, therefore, have brought them into the different countries where those species exist at the present day. They are now propagated through every country of the globe.

A pure Dorking fowl is of large size and rounded contour, and furnished with one or more additional, but imperfect, toes; the legs are short, and the plumage white. The breed, of late years, has been much crossed with the common dunghill fowl, and with the Sussex race, but without any deterioration. The flesh is remarkably white and delicate in flavour. They are not easily obtained in the place to which they have aided in giving celebrity; but vast numbers of them are regularly sent to the London markets.

A brood of fowls, called the Spanish, is often seen around London. They are of a very large size, and the hens lay enormous eggs, but they do not sit well. The plumage is black, the comb large and often pendulous, and the naked skin behind the ears white.

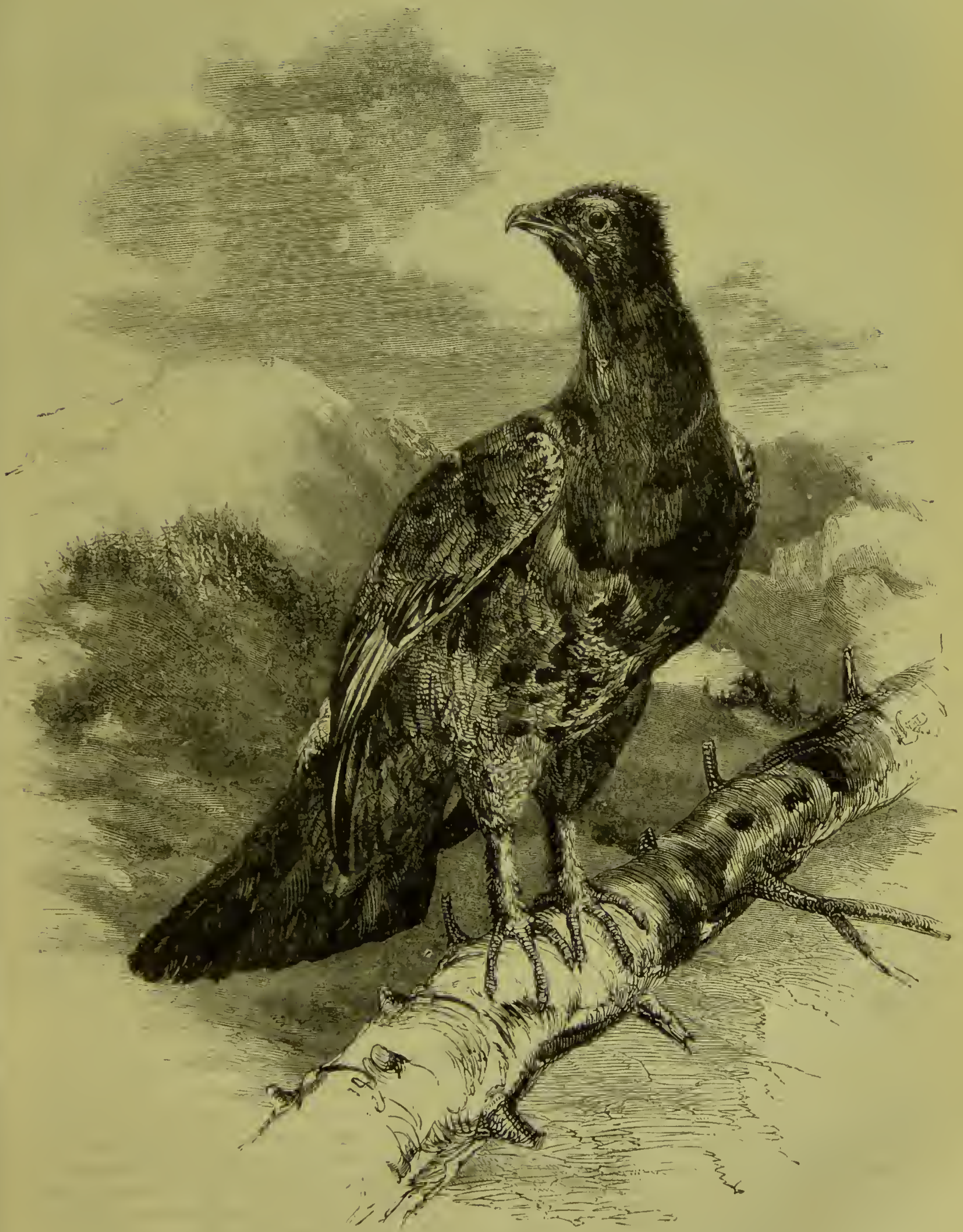
The black Poland or Hamburg breed have a large top-knot of long white feathers. The gold-spangled and silver-spangled Polands are remarkable for their beauty of plumage. These have small combs on the forehead, and a full top-knot of feathers on the crown. Fine fowls of these breeds are highly valued.

The game cock, which is probably a native of India, though for many centuries established in England, has an unusual length of spur, his natural weapon of combat. The flesh of this variety is delicately white, and of the finest flavour; the plumage is brilliant, and the form symmetrical; but from their pugnacious temper, there is great difficulty in rearing even those of the same brood.

Buffon describes a curious scene, of which he was a witness. A sparrow-hawk alighted in a populous court-yard, when a young cock, of that year's hatching, instantly darted at him, and threw the foe on his back. In this situation the hawk defended himself with his talons and his bill, intimidating the hens and turkeys, which screamed tumultuously around him. When he had slightly recovered, he rose, and was taking wing; when the cock rushed on him a second time, overturned him again, and held him down so long, that he was caught.

The patience and perseverance of the hen while hatching are truly extraordinary. She covers her eggs with her wings, fostering them with a genial warmth, often turning them, and changing their situation, that all their parts may receive an equal degree of warmth. So intent is she on her task, as to neglect, in some degree, even the ordinary supplies of food and drink. In about three weeks, the young brood burst from their confinement, when, from being one of the most cowardly and voracious, she becomes the most daring and abstemious of all animals. If she casts her eyes on a grain of corn, or even a crumb of bread, she will not touch it, but gives her numerous train immediate notice of her success by a peculiar call, which they all understand. Instantly they flock around her, and the precious morsel is divided among them. Though by nature timid, and apt to fly from the smallest assailant, yet, when marching at the head of her brood, she is fearless of danger, and will fly in the face of the fiercest animal which offers to annoy her.

Mr. Jesse says: "I am always sorry to see the anxiety and misery of a hen who has hatched ducks, instead of her natural progeny. When they take to the water she is in a perfect agony, running round the brink of the pond, and sometimes flying into it, in hopes of rescuing her brood from the danger she apprehends them to be in. A friend of mine observed a remarkable instance of the degree to which this natural apprehension for her brood may be overcome in the hen by the habit of nursing ducks. A hen who had reared three broods of ducks in three successive years, became habituated to their taking to the water, and would fly to a large stone in the middle of a pond, and patiently and quietly watch her brood as they swam about it. The fourth year she hatched her own



THE CAPERCAILLIE.

eggs, and finding that her chickens did not take to the water, she flew to the stone in the pond, and called to them with the utmost eagerness."

The possibility of the existence of wild cocks in America has sometimes been denied. But it should not be said that, since these birds inhabit India, China, and the Islands of the Eastern Archipelago, in a state of freedom, it cannot follow that America possesses none of them in the same state; for facts to the contrary may easily be cited.

M. Sonnini thus expresses himself on the subject:—"Travelling in the sombre and solitary forests of Guiana, when the dawn first began to shed a less lugubrious tint, in the midst of those immense trees which never fall but beneath the axe of time, I have frequently heard a cry perfectly resembling the note of our domestic cock, but less powerful and sonorous. The considerable distance from all inhabited places could not permit us to believe that this crowing, which the companions of my journey heard very distinctly, was produced by domestic birds, and the Indians by whom we were followed told us that it was the cry of wild cocks. In one of these journeys, I myself beheld on a mountain a bird about the size of a pigeon, with brown plumage, bearing on its head a fleshy crest, having the wings short, and the tail arranged exactly like that of the hen, whose port and gait it altogether exhibited. I was able to examine it very well, and it did not appear very wild or shy; the negro who had carried my fusee had stopped at some distance, and when he rejoined me the bird was flown into the depth of the forest, and we searched for it to no purpose.

"This fact, the crowing of the cocks which we heard in the woods, and the knowledge of the wild cocks possessed by the natives, left no doubt on my mind respecting the existence of these cocks in South America; and I have now put forth what I had the opportunity of ascertaining, without any other pretensions than to make known a mere fact in the natural history of the *Gallinæ*."

Some remarkable specimens have been described by travellers, as the Frizzled * and the Silky † Fowls, of Asiatic origin, of which we give an engraving.

WALLIKIKI POULTRY.

The Manx Cat ‡ is absolutely tailless, and so are the birds in the Zoological Gardens of Paris, of which we have given an engraving. They are of Persian origin, as is their name, Wallikiki. The Abbé Rozier speaks of them as resembling others in size and variety of colour, under the title of the "Tailless Hen." In Holland the species is well known, and there the crowing of the cock is said to be different from that of ordinary fowls. A hen generally lays about 200 eggs in a year. The chickens are not marketable, on account of their deformed appearance, but the breed is really as valuable as that of any other species of domestic poultry.

We now arrive at another family,§ in which are several valuable birds as affording food for man.

THE CAPERCAILLIE.||

The name thus given to the Wood Grouse is of Gallic origin, and literally means the horse of the wood. This bird is supposed to have been an inhabitant of the British isles within the last century. It is still to be found in most parts of the Scandinavian peninsula;—indeed, as far to the north as the pine-tree flourishes, which is very near to the North Cape itself. It is, however, more scarce in the more southern of the Swedish provinces.

Its favourite haunts are extensive fir-woods. In coppices, or small cover, it is seldom or never found. The birds which breed in the larger forests remain there all the year round; but those, on the contrary, which breed on elevated mountains, the summits of which are destitute of trees, or in a more open part of the country, in the event of deep snow, usually fall down to the lower grounds.

The principal food of the capercali, in its natural state, consists of the leaves of the Scotch fir. It also eats juniper-berries, cranberries, blueberries, and other berries common to the northern forests; and occasionally also, in the winter time, the buds of the birch, &c. It very rarely feeds on the leaves of the spruce. The young birds feed chiefly at first on ants and other insects, as well as worms.

The capercali makes her nest on the ground, and lays from six to twelve eggs; it is said she sits for four weeks. Her young keep with her until towards the approach of winter; the cocks, however, separate from the mother before the hens. The most clear and ample accounts of these birds are given by Mr. L. Lloyd, in his "Field Sports of the North of Europe," including those of Professor Nilsson and Mr. Greiff, and to these we shall be indebted in the description which our present limits will allow.

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* Gallina crispa. † Otis. ‡ Mammalia, vol. ii., p. 94. § Tetraonidæ. || Tetrao urogallus.

Excepting there be a deep snow, the capercali is much on the ground in the day-time; very frequently, however, it sits on the uppermost branches of the pines. During the night, if the weather be very cold, it often buries itself in the snow. Its flight is not particularly heavy or noisy, and it has been observed at a very considerable height in the air, and to be taking a flight of many miles at a time.

BLACK GROUSE.

These birds live to a considerable age. The cocks do not attain their full growth until their third year or upwards. The older ones may be easily known from their greater bulk, their eagle-like bill, and the more beautiful glossiness of their plumage. The size of these birds appears to depend, in a great degree, on the latitude where they are found. In Lapland, for instance, the cocks (the hens being much smaller) seldom exceed nine or ten pounds. In Wermeland and adjacent parts, Mr. Lloyd never heard of their exceeding thirteen pounds; whilst in the more southern provinces of Sweden they have not unfrequently been met with weighing seventeen pounds and upwards. The hen capercali usually weighs from five to six pounds.

With the capercali, as with other birds, occasional varieties of plumage will be found. A hen, that was shot in one of the southern provinces of Sweden during autumn, was, with the exception of a few gray feathers on different parts of the body, perfectly white. This bird, however, had several young ones, the plumage of all of which was of the usual colour.

THE BLACK GROUSE.*

The Black Grouse, or Heath Cock, is only met with in uncultivated wastes, which are covered with heath and juniper. It feeds on the mountain and bog-berries, and when these are scarce, on the tops of heath. This bird abounds in North Wales and in the Highlands of Scotland; and they are found in the southern parts of England.

"Good-morrow to thy sable beak
And glossy plumage dark and sleek,
Thy crimson moon and azure eye,
Cock of the heath, so wildly shy:
I see thee slyly cowering through
That wiry web of silver dew,
That twinkles in the morning air,
Like casements of my lady fair.

"A maid there is in yonder tower,
Who, peeping from her early bower,
Half shows, like thee, her simple wile,
Her braided hair and morning smile.
The rarest things with wayward will,
Beneath the covert hide them still;
The rarest things to break of day.
Look shortly forth and shrink away.

"A fleeting moment of delight
I sunn'd me in her cheering sight,
As short I ween the time will be
That I shall parley hold with thee.
Through Snowdon's mist red beams the day,
The climbing herdboy chants his lay,
The gnat-flies dance their sunny ring -
Thou art already on the wing."†

In the spring, the males resort to some particular elevated and open spots, where they may be heard in the morning and evening inviting the females by their call, displaying a variety of attitudes, and uttering, as Mr. Selby says, a crowing note, accompanied by another sound, similar to that made by the whetting of a scythe. This call is obeyed by the females, who do not long, however, engross the attentions of the males.

The females make a slight nest on the ground, frequently sheltered by some low thick bush. Here they deposit from six to eight eggs, of a yellowish-white, spotted and speckled with orange-brown. The males are selfish creatures, leaving them not only to the solitary task of incubation, but to that also of providing for the young.

Considerable packs of these birds, composed as well of cocks as hens, are often to be seen in the northern forests during the winter time. They are most commonly to be met with near to the margins of lakes and rivers, where the birch usually grows in abundance; as it is from the buds of that tree the black cock derives the principal part of his subsistence during the inclement period of the year.

If the snow be loose and deep, this bird, like the capercali, often burrows beneath its surface. In general he is entirely hidden from view, though sometimes his bill protrudes above the snow; thus, he is fully protected from the weather, let the temperature be ever so severe.

THE RED GROUSE.‡

This is a handsome species, and though called by Pennant *Scoticus*, is worthy of a more general appellation, since it is found not only in Scotland, but in the north of England, in Wales, and in Ireland.

It is, however, especially abundant in Scotland. Mr. Macgillivray says, that the low sandy heaths of the eastern counties of the middle division appear to be less favourable to it than the more moist peaty tracts of the western and northern districts, where the shrubs on which it feeds attain a greater size. In the central and desolate regions of the Grampians it is equally abundant as on the moors of the Hebrides; and on the hilly ranges of the south, the Pentlands, the Lammermuir, and the mountains of Peebles, Dumfries, and Selkirk, it is still plentiful.

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* Tetrao tetrix.

† Joanna Baillie.

‡ Tetrao Scoticus: Pennant.

A depression of the ground, sheltered by a tuft of heather, suffices for a nest, which is formed of the stems of ling and grass, with occasionally a few feathers. The eggs are from eight to fourteen or fifteen in number, of a reddish-white ground colour, nearly covered with brown blotches and spots.

Their natural enemies—the birds of prey—have been much thinned. The seasons have been rendered milder in their haunts by the progress of cultivation in their vicinity; and the throwing of much of the country into sheep-walks has given them more repose in the central highlands than when the glens abounded with human dwellings. Yet still the boundaries of the moor-fowl have been circumscribed, and the pasturage of sheep tends to destroy their favourite heather, which is the only good cover that they have, both from the weather and their enemies. It is, therefore, probable that, with more preservation than formerly, the numbers of these birds are considerably diminished.

THE PTARMIGAN.*

The common Ptarmigan is not only a native of Scotland, but of the higher latitudes of continental Europe, where the willow ptarmigan and the rock ptarmigan are also abundant. In their manners the ptarmigans naturally resemble each other. But in Scotland, a comparatively temperate climate, the bare and bleak mountains are the permanent abode of the species there indigenous; while, under the intense severity of winter within the polar circle, they all quit the more exposed situations and seek the willows and copse-woods which border the rivers, and stretch over the sheltered vales. Mountain-berries and heath-shoots in summer, spring-buds and leaves in winter, constitute their food, in search of which, as well as for the sake of shelter, they burrow beneath the snow.

THE PTARMIGAN.

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* Lagopus mutus: Selby.

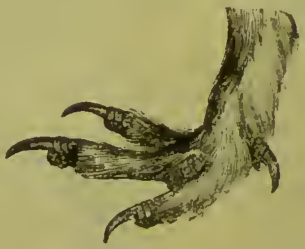
Perhaps the changes of plumage in none of the feathered tribes are more worthy of attention than those the ptarmigans undergo. Their full summer plumage is of yellow more or less inclining to brown, beautifully barred with zig-zag stripes of black; their winter plumage is pure white, except that the outer tail-feathers, the shafts of the quills, and, in our species, a streak from the eye to the beak, are black.

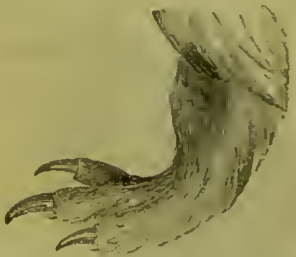
Now, in both these cases, there is a benevolent provision for the safety of these birds. Thus, in summer the brown patches of heath on the rocky sides of the mountains assimilate well, in their broken and blended tints, with the attire of the ptarmigans; and, as concealment from their enemies is one of the laws of Nature, this end is effectually answered. But when the mountains are covered with snow, and all around is attired in a mantle of dazzling white, were the plumage of these birds to continue as it was, they would at once attract the Iceland falcon and the snowy owl. The white feathers, on the contrary, which clothe them at this season, are sure to defend them from their foes.

The saying of the poet may often be recalled in the study of this as well as of other portions of the Divine operations:—

> "In human works, though laboured on with pain,
> A thousand movements scarce one purpose gain;
> In God's, one single can its end produce,
> Yet serves to second, too, some other use."

And so it is here. The white plumage is a defence against the cold of winter, as are other provisions, by which it is accompanied; for then the legs of the ptarmigan, which have been covered with feathers of a hair-like and downy texture, extending as far as the toes, are now so enveloped as to resemble the feet of a well-furred quadruped, while the bill is almost hidden. The additional reason of this will speedily be apparent.


FOOT OF THE PTARMIGAN IN WINTER.


FOOT OF TETRAO PARADOXUS: PALLAS.

It is well known that colour greatly influences the rate at which bodies either reflect heat, or acquire and part with it, and that objects which reflect heat the most part with it the least. Reflection takes place most readily in objects of a white colour, and from such, consequently, heat will radiate with difficulty. If, then, two animals, one of a black colour and the other white, be placed in a higher temperature than that of their own body, the heat will enter the one that is black with the greatest rapidity, and elevate its temperature considerably above the other. But when these animals are placed in a situation the temperature of which is considerably lower than their own, the black animal will give out its heat, by radiation, to every surrounding object colder than itself, and speedily have its temperature reduced; while the white animal will part with its heat by radiation at a much slower rate. The winter colour of the ptarmigan, therefore, combined with its increased fulness of plumage, tends to limit the expenditure of the vital heat generated in the system; though some expenditure must take place. This power of generating heat in the animal system, it may be added, is the principle on which all animals are enabled to withstand the effect of cold, and to preserve life and health in a low temperature.

The *Tetrao paradoxus*, the foot of which is represented, inhabits the steppes of Bucharia and Tartary.

THE PINNATED GROUSE.*

This American bird is often called the heath-hen. In size, shape, and habits, it strongly resembles the red grouse, already described; but the plumage is not at all alike; for the former is of a peculiar gray, or dark ash-colour, without the dusky red of the latter. The flavour of the flesh much resembles that of the British grouse, but the colour of it is scarcely so dark.

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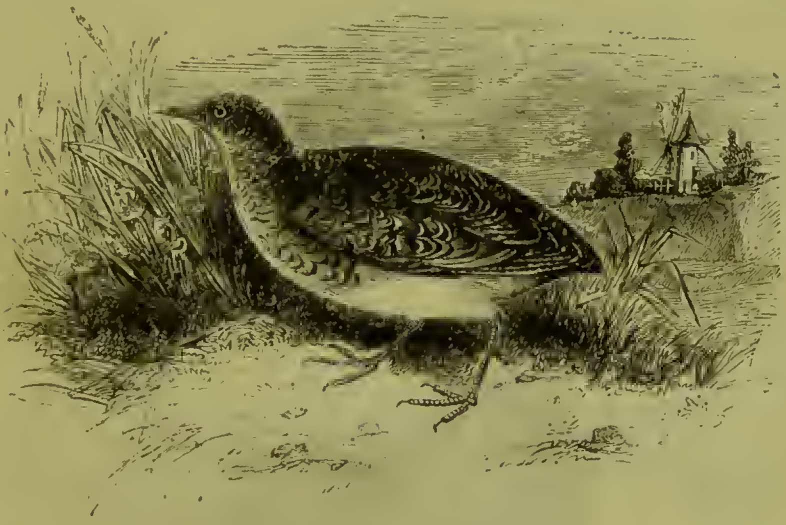
* Tetrao cupido.

These birds are found, for the most part, in those wild and elevated situations where, either from the sterility of the soil or the very considerable altitude, there are no forest-trees; the only vegetation being two or three sorts of heath and a little alpine moss. The subsistence of these grouse is, therefore, restricted to the young shoots of alpine plants, or the berries they produce; for, during the rigours of a North American winter, they are never known to migrate to milder and more settled regions, or, indeed, to any situations which do not yield their favourite food.

An adult grouse, when fat, weighs about three pounds avoirdupois. But the eagerness of the sportsmen is so great, that a large proportion of those they kill are but a few months old, and have not attained their full growth.

The season for pairing is in March, and the breeding-time is continued through April and May. The male grouse utters a peculiar sound, which may be heard on a still morning for three or four miles, while the parts about the throat are sensibly inflated. This sound is called *tooting*, from its resemblance to the blowing of a conch or horn from a remote quarter.

The female makes her nest on the ground, in recesses very rarely discoverable by man. She usually lays from ten to twelve eggs, of a brownish colour, much resembling those of the guinea-hen. When hatched, the brood is protected by her alone; and, surrounded by her young, she exceedingly resembles the domestic hen with her brood. When she utters a cry of alarm, the little ones immediately scamper to the brush, and while they are skulking into places of safety, their anxious parent beguiles the spectator by letting fall and fluttering her wings, limping along the path, rolling over in the dirt, and other pretences of inability to fly and even to walk.



HEMIPODIUS TACHIDROMUS.

During the period of pairing, and while the females are occupied in incubation, the males are accustomed to assemble, principally by themselves. They repair to some select and central spot, where there is very little underwood. The time of meeting is the break of day, and as soon as the light appears, sometimes forty or fifty are thus assembled from the neighbourhood. When the dawn is past, the ceremony begins by a low tooting from one of the cocks. This is answered by another. They then come forth from the bushes, one by one, and strut about with all the pride and ostentation they can put forth. Their necks are incurvated; the feathers on them rise into a kind of ruff; the plumes of their tails are expanded like fans; and their movements emulate, so to speak, the pomp of the turkey-cock. They seem to vie with each other in stateliness; and as they pass one another, frequently cast looks of insult, and utter notes of defiance. These are the signals for battles, in which they engage with wonderful spirit and fierceness. During these contests, they leap a foot or two from the ground, and utter a discordant, cackling, screaming cry.

To the production of this sound Wilson particularly alludes. "What appears to me," he says, "the most remarkable circumstance relative to this bird is, that not one of all those writers who have attempted its history have taken the least notice of those extraordinary bags of yellow skin which mark the neck of the male, and which constitute so striking a peculiarity. These appear to be formed by an expansion of the gullet, as well as the exterior skin of the neck, which, when the bird is at rest, hangs in loose, pendulous, wrinkled folds, along the side of the neck, the supplemental wings, at the same time, as well as when the bird is flying, lying along the neck. But when these bags are inflated with air, in breeding-time, they are equal in size, and very much resemble in colour, a middle-size, fully-ripe orange. By means of this curious apparatus, which is very observable several hundred yards off, he is enabled to produce such extraordinary sounds, which, though they may easily be imitated, are yet very difficult to describe in words. The sound consists of three notes, of the same tone, resembling those produced by the night hawks in their rapid descent, each strongly accented, the last being twice as long as the others."

HEMIPODIUS TACHIDROMUS.*

This bird inhabits the meridional parts of Spain, Sicily, and North Africa.

The next birds to be noticed are often placed as forming a separate family,† and sometimes as a sub-family of the *Tetraonidæ.*‡

THE PARTRIDGE.§

The Partridge is essentially the tenant of the open corn-fields. It is common in the corn counties of Britain and on the adjacent continent, being, in fact, most abundant where the labours of the ploughman are the most extensive.

THE PARTRIDGE.

In February the pairing time takes place, and the males often fight obstinately with each other. The female lays her eggs at the latter part of May or the beginning of June, selecting a shallow excavation under a tuft of herbage for their reception. The male leaves the work of incubation entirely to his mate, but joins her when the brood is hatched, and unites with her in its protection.

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* Tetrao Andalusicus: Gmelin.

† Perdicidæ.

‡ Perdicinæ.

§ Perdix cinerea: Pennant.

Few birds are more solicitous in rearing their young, and many are the stratagems which the parents will practise to draw off attention from the brood, which by signal notes is scattered and recalled. Of this Markwick gives the following proof:—"It is not uncommon to see an old partridge feign itself wounded, and run along the ground fluttering and crying before either dog or man, to draw them from the helpless unfledged young ones. I have often seen it, and once, in particular, I saw a remarkable instance of solicitude in the old bird to save its brood. As I was hunting with a young pointer, the dog ran on a brood of very small partridges; the old bird cried, fluttered, and ran tumbling along just before the dog's nose, till she had drawn him to a considerable distance, when she took wing and flew still further off, but not out of the field. On this the dog returned to me, near the place where the young ones lay concealed in the grass. This the old bird no sooner perceived than she flew back again to us, settled just before the dog's nose, and by rolling and tumbling about again, drew off his attention from the young, and thus preserved her brood a second time. I have also seen when a kite has been hovering over a covey of young partridges, the old birds fly up at the bird of prey, screaming and fighting with all their might to preserve their brood."

THE RED-LEGGED PARTRIDGE.

Selby mentions a well-authenticated instance in which two partridges, in defence of their brood, gave battle to a carrion-crow, and actually held the miscreant till taken away from them by the spectator of the scene.

Except during the breeding season, partridges associate in flocks or coveys.

"Fearful and cautious are the latent prey,
As in the sun the circling covey bask
Their varied plumes, and watchful every way,
Through the rough stubble turn the secret eye.
Caught in the meshy snare, in vain they beat
Their idle wings, entangled more and more.
Nor on the surges of the boundless air,
Though borne triumphant, are they safe;
Glanced just and sudden from the fowler's eye,
The gun o'ertakes their sounding pinions, and again,
Immediate, brings them from the towering wing,
Dead to the ground or drives them wide, dispersed,
Wounded, and whirling various, down the wind."[*]

So rapid, however, is the multiplication of the partridge as almost to defy extermination; nor will persecution drive it from its haunts. The covey will rise, whirl about, and alight, again and again; but though they may be diminished by the gun, the survivors will often continue in the same turnip-field, or on the same clover-stubble, as pertinaciously as a mountain tribe has clung to their fastnesses in a war of extirpation.

The partridge, like the pheasant, feeds early in the morning and late in the evening, the covey resting during the day among herbage, or basking on dry banks, or, like the fowl, dusting their plumage and cleaning their feathers. At night they generally choose the middle of a large field as their roosting-place, and sit crowded together. The call of the partridge is usually heard before the covey retire to rest; they answer each other, and thus the stragglers are collected.

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[*] Thomson.

On the esteem in which the partridge is held for its flesh we need not expatiate. An old distich says :—

> " If partridge had the woodcock's thigh,
> 'Twould be the best bird e'er did fly."

THE RED-LEGGED PARTRIDGE.*

An enemy to the bird just described has been introduced from the Continent into England within about sixty years; driving it from the lands and inclosures in which it has become established.

THE QUAIL.

The Red-legged Partridge is a native of France and Southern Europe, and the isles of Jersey and Guernsey. The Marquis of Hertford and Lord Rendlesham procured some of its eggs, and had them placed under the common hen; the former nobleman at one of his shooting residences in Suffolk, the latter at an estate in the same county. It was from these two spots that the species gradually extended itself; and in Norfolk, Suffolk, Essex, and the adjacent counties, it is now very abundant. The flesh of this bird, though highly prized by some, is inferior to that of the common partridge, and it is also less juicy.

THE QUAIL.†

The Quail with which we are acquainted is much less than the partridge, being only about seven inches in length; it however resembles that bird in its form and modes of life, and its flesh is excellent.

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* Perdix rubra: Brisson.

† Coturnix dactylisonans.

It is widely spread, being found throughout the whole of Southern and temperate Europe, and the greater part of Asia and Africa, but is everywhere migratory.

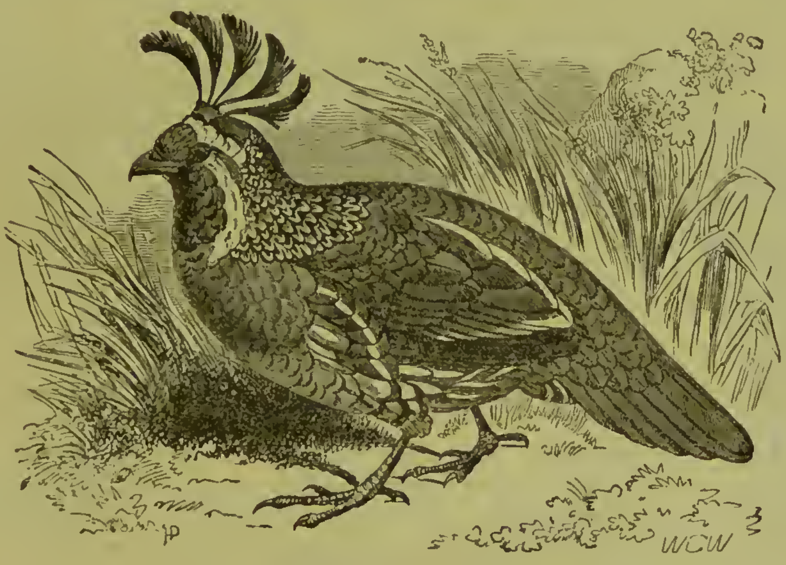
The female makes an artless bed in a slight hollow of the ground for her eggs, which are of a green tint, and vary in number from eight to twelve, or even fifteen. In England the quail makes its appearance in May, but not in such great abundance, it is said, as formerly. In October it departs to Africa, which is the great winter abode of this species.

The female has not the dark half-circular marks descending down the sides of the neck, nor the black patch in front, which distinguishes the male bird. The feathers on her breast, however, are strongly marked with a small dark spot on each side of the light straw-coloured shaft. The young birds of the year resemble the adult female.

Richly cultivated lands are the favourite localities of these birds, and especially extensive wheat-fields. Unlike the partridge, they are polygamous, and on their first arrival the males may be heard uttering their whistling call, in defiance of each other.

THE CALIFORNIAN QUAIL.*

There is a group in America representing the quails and partridges of the Old World, to which has been given the name of *Ortyx.* These birds have a greater stoutness of bill than those just mentioned; the tail, which is somewhat wedge-shaped and rounded at the extremity, is also more elongated. They closely resemble the quails in their general manners and pugnacious habits, but they have no spurs on the tarsi. They frequent thickets and bushes, building their nests on the ground, and migrate during the winter to more temperate regions.



THE CALIFORNIAN QUAIL.

The most beautiful species is that of which we give an engraving. This bird was first discovered by the unfortunate La Perouse; and it is stated by the editor of his "Voyage," that it was found in great abundance in the low woods and plains of California, assembled in bands of two or three hundred, and that it was fat and well-flavoured.

Little, however, was known of the Californian Quail till Captain Beechey brought over several, as one result of his voyage of discovery. The beautiful crest on the head adds greatly to their appearance.

THE VIRGINIAN COLIN.†

This bird is a general inhabitant of North America, from the northern parts of Canada and Nova Scotia, in which latter place it is said to be migratory, to the extremity of the peninsula of Florida. Audubon says, its common name in the eastern and middle districts is that of quail, but in the western and southern states it is called a partridge. Their food, in a wild state, consists of grain, seeds, insects, and berries; but buck-wheat and Indian corn are also particular favourites.

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* Lophortyx Californicus.

† Ortyx Virginianus.

In America there are, in fact, no true partridges; but a numerous family of colins supply their place, of which some thirty-five species are already known, and others, most probably, remain to be described. Little difficulty would attend their acclimitisation; and all that are known are exceedingly prolific. Three examples—the Cuban Colin,[*] the Crested Colin,[†] and the Californian Colin[‡]—may be seen in our Zoological Gardens, besides the Virginian Colin.

Another family[§] of birds now demands consideration, consisting of those in which the locomotive energy is thrown into the lower extremities, the wings being in no instance adequate to raising the body into the air, and in the majority of cases merely rudimentary. The true wing bones are best developed in the Rhea; the next best development is in the Ostrich; while in the Cassowary, Emeu, and Apterix, the lowest development of these bones is exhibited. A glance at an ostrich's skeleton will show the strongly developed pelvis and posterior limbs.

THE OSTRICH.[‖]

The Ostrich, the Camel-bird of the Arabs, has been celebrated from the earliest antiquity. It is found throughout Arabia and Africa, everywhere shunning the presence of man, and preferring the solitude of the desert.

The food of the ostrich consists of the tops of the various shrubby plants which the most arid parts of South Africa produce in abundance. It is so easily satisfied with regard to water, that it is constantly to be found in the most parched and desolate tracts which even the antelopes and the beasts of prey have deserted. Its cry at a distance so much resembles that of the lion, that the Hottentots are said to be sometimes deceived by it.

The male ostrich of South Africa, at the time of breeding, usually associates to himself from two to six females. The hens lay all their eggs together in one nest, the nest being merely a shallow cavity scraped in the ground, of such dimensions as to be conveniently covered by one of these gigantic birds in incubation. An ingenious device is employed to save space, and give at the same time to all the eggs their due share of warmth. Each one of the eggs is made to stand with the narrow end on the bottom of the nest, and the broad end upwards; and the earth which has been scraped out to form the cavity is employed to confine the outer circle, and keep the whole in the proper position. The hens relieve each other in the task of incubation during the day, and the male takes his turn at night, when his superior strength is required to protect the eggs or the newly-fledged young from the jackals, tiger-cats, and other enemies. Some of these animals, it is said, are not unfrequently found lying dead near the nest, destroyed by a stroke from the foot of this powerful bird.

No fewer than sixty eggs are sometimes found in and around an ostrich's nest: but a smaller number is more common; and incubation is occasionally performed by a single pair of ostriches. Each female lays from twelve to sixteen eggs. They continue to lay during incubation, and even after the young brood are hatched. The supernumerary eggs are not placed in the nest, but around it, being designed to aid the nourishment of the young birds, which, though as large as a pullet when first hatched, are probably unable at once to digest the hard and acrid food on which the old ones subsist. The period of incubation is from thirty-six to forty days. Occasionally the nest is left by all the birds in the middle of the day, the heat of the sun being then sufficient to keep the eggs at the proper temperature.

As to the passage in the Book of Job (xxxix. 14), it may be remarked that within the torrid zone the heat of the sun's rays renders the incubation of the female unnecessary, excepting, perhaps, at night; but in the cooler latitudes she is assiduous in performing the maternal office. In Caffraria, the Rev. J. Broadbent, on approaching an ostrich's nest, remarks:—"We saw the female sitting upon it; and though she had been disturbed before by the Hottentot, she remained till we were very near, and then ran off at the report of two guns which were fired. The ground was sandy for several miles round, and covered with thinly scattered bushes. There lay a great number of loose ostrich

[*] Ortyx Cubensis.

[†] Eupsychortyx cristatus.

[‡] Callipepla Californica.

[§] Struthionidæ.

[‖] Struthio camelus.—Linnæus.

feathers about the nest, which appeared to have come off the female while sitting, and she had the naked appearance which domestic fowls have at such times.

"The eggs were forty-two in number, and were arranged with great apparent exactness. Those which were in the circle we found to be quite fresh, at which I expressed my surprise. The Hottentot informed me that these had been provided for the ostrich against the hatching of those in the middle, when she would break them, one after another, and give them to her young ones for food; and that by the time they were all disposed of in this manner, the young ostriches would be able to go abroad with their mother, and provide for themselves such things as the desert afforded. This fact affords a fine instance of animal instinct."

THE OSTRICH.

An ostrich egg is considered as equal in its contents to twenty-four of the domestic hen. When taken fresh from the nest they are very palatable, and are wholesome, though somewhat heavy food. The best mode of cooking them is that practised by the Hottentots, who place one end of the egg in the hot ashes, and, making a small orifice in the other, keep stirring the contents with a bit of stick till they are sufficiently roasted; and then, with a seasoning of salt and pepper, there is a very nice omelette.

The ostrich of South Africa is a prudent and wary bird, and displays but little of the stupidity charged upon it by some naturalists. On the borders of the Cape colony, at least, where it is eagerly pursued for the sake of its valuable plumage, the ostrich discovers no want of sagacity in providing for its own safety or the security of its young. It adopts every possible precaution to conceal the place of its nest, and uniformly abandons it, after destroying the eggs, if it perceives that they have been disturbed, or the footsteps of man have been discovered near it. In relieving each other in hatching, the birds are said to be careful not to be seen together at the nest, and are never observed to approach it in a direct line.

Though the ostrich is generally admitted to go faster than the swiftest horse, yet the Arabs on horseback contrive to run these birds down, their feathers being valuable, and their flesh not to be despised. The best horses are trained for this chase. When the hunter has started his game, he puts his horse on a gentle gallop, so as to keep the ostrich in sight, without coming too near to alarm it and put it to its full speed.

On finding itself pursued, the bird begins to run at first but gently; its wings, like two arms keeping alternate motion with its feet. It seldom runs in a direct line, but, like the hare, doubles, or rather courses, in a circular manner; while the hunters, taking the diameter, or tracing a smaller circle, meet the bird at unexpected turns, and with less fatigue to the horses. This chase is often continued for a day or two, when the poor ostrich is starved out and exhausted, and finding all power of escape impossible, it endeavours to hide itself from the enemies it cannot avoid, running into some thicket, or burying its head in the sand; the hunters then rush in at full speed, leading as much as possible against the wind, and kill the birds with clubs, lest the feathers should be soiled with blood.

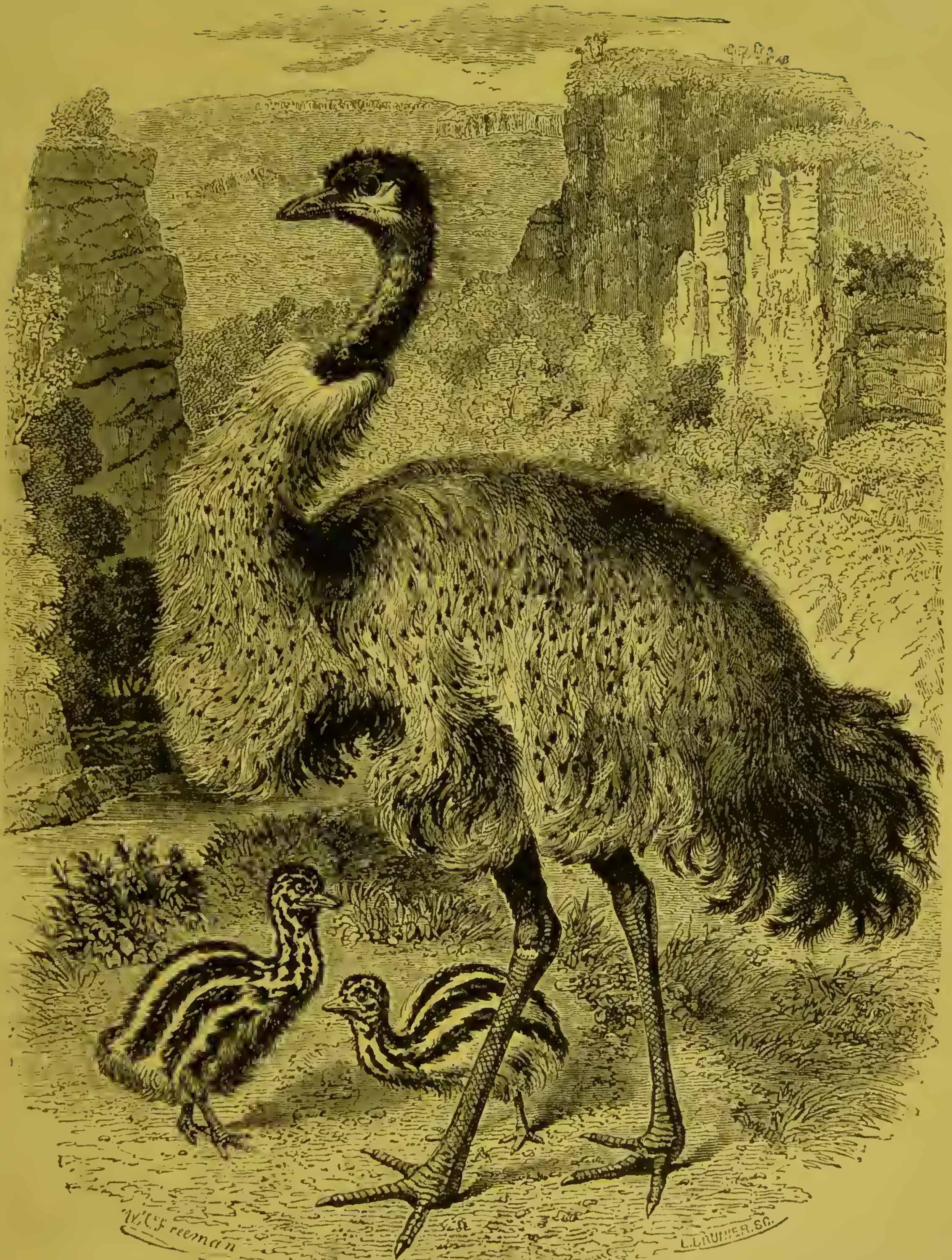
M. Adanson saw two tame ostriches, which had been kept two years at the factory of Podor, on the south bank of the Niger. He says:—"They were so tame that two little blacks mounted both together on the back of the largest; no sooner did he feel their weight, than he began to run as fast as ever he could, till he carried them several times round the village; and it was impossible to stop him, otherwise than by obstructing the passage.

"This sight pleased me so well, that I would have it repeated; and, to try their strength, I made a full-grown negro mount the smallest and two others the largest. This burden did not seem to me at all disproportioned to their strength. At first they went at a moderate gallop; when they were heated a little they expanded their wings, as if it were to catch the wind, and they moved with such fleetness that they seemed to be off the ground. Everybody must, some time or other, have seen a partridge run, consequently must know that there is no man whatever able to keep up with it; and it is easy to imagine, if this bird had a longer step, its speed would be considerably augmented. The ostrich moves like the partridge, with both these advantages; and I am satisfied that those I am speaking of would have distanced the fleetest race-horses that were ever bred in England. It is true, they would not hold out so long as a horse; but, without all doubt, they would be able to perform the race in less time. I have frequently beheld this sight, which is capable of giving one an idea of the prodigious strength of an ostrich, and of showing what use it might be made of, had we but the method of breaking it and managing it as we do a horse."

The foot of the ostrich is not a little remarkable. It is divided into two toes only, and each toe, well padded beneath, is armed at the extremity with what may properly be called a hoof. The whole strongly resembles the foot of the camel. In the noble gallery of the British Museum, there is a fine and well-preserved series of young ostriches; but not the slightest trace of a nail is observable on the external toe of any of them, any more than on that of the adult bird.

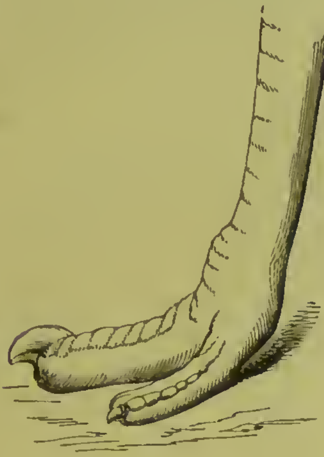
Another point of resemblance between the quadruped and the bird may also be mentioned. The camel has a callous naked protuberance on the chest, on which, when reposing, the animal throws a great portion of the weight of the body. This protuberance occurs in the ostrich.

The flesh of the ostrich, when young, is good and palatable, and the eggs are considered a great delicacy. Both Europeans and natives agree in this last opinion. The Hottentot—who abstracts the egg from the nest with a long stick, that the hen may not take alarm at the human touch, and not abandon the nest, but go on laying, as the common hen will do to a great extent when her nest is



THE CASSOWARY.

robbed—buries them in hot ashes. They are said to be excellent when eaten with a sufficient quantity of butter. The brains of hundreds of these birds not unfrequently made a dish at the insane Roman suppers; and Firmus is said to have eaten a whole ostrich at a meal. The flesh of this bird was prohibited by the Mosaical law as unclean, and the Arabs regard it in the same light; but many of the barbarous tribes in the interior of Africa feed on it without scruple. The well-known plumes form a material article of commerce for the head-dresses of European and other ladies.



FOOT OF THE OSTRICH.

FOOT OF THE CAMEL.

Another division of this family* presents some marked differences from the preceding. Here the bill is straight, carinated above, rounded and bent at the point; the upper mandible slightly vaulted, the edges depressed, and notched or jagged towards the extremity; the lower mandible rather angular below, towards the point; the nasal fossæ nearly as long as the bill; the head is helmeted; the front of the neck is naked, and furnished with two wattles; the toes are three; the wings are entirely unfit for flight, and furnished with five rounded, naked, pointed quills.

THE EMEU.†

The Emeu seems to have been unknown in Europe until the sixteenth century, when the Dutch, on their return from their first voyage to India, brought one from the island of Java. This bird was given them by the reigning prince. For a considerable time it was exhibited at Amsterdam for money; it was then sold to the Count de Solms, who gave it to the Elector of Cologne, and by him it was presented to the Emperor of Germany. In the course of the ensuing six years, the Dutch merchants shipped two others from the same place, but both of these died on the voyage. In the year 1671 an emeu was sent by the Governor of Madagascar to the King of France, which was kept alive for four years in the royal menagerie at Versailles. Since that period these birds have been frequently brought into Europe, and as they bear its climate well, they are to be found in various places.

The head of the emeu is surmounted with a bony prominence, covered with a horny substance; the skin of the head and the upper part of the neck are naked, and tinged with cærulean blue and flame-colour; the bird has pendent wattles, like those of the turkey-cock; the wings are furnished with some stiff, featherless quills; and the nail of the internal toe is much the strongest. "It is," says Cuvier, "the largest of the birds after the ostrich, from which it differs sufficiently in its anatomy, for it has short intestines and small cœca, wants the intermediate stomach between the crop and the gizzard, and its cloaca does not exceed that of other birds in proportion." Its height, when erect, is about five feet.

This species is characterised by Lesson as "stupid and massive;" and he says it feeds on seeds and herbage. Bontius considers that it ought not to be classed among birds, because the wings it has are calculated to aid in running, not in flight. He states that, when irritated, the bird does not rush forward to the attack, but turns itself obliquely, kicking backwards at the enemy. Cuvier observes, that the featherless quills serve the emeu for offensive weapons. Bontius remarks, that the eggs are very different from those of the ostrich, by reason of their thinness and colour; for their shell is greenish, ornamented with numerous tubercles of a deeper green.

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* Casuarius.

† Casuarius Emeu.

The emeu is found in the peninsula of Malacca, and the great chain of islands to the south and east. Bontius notes it from Ceram and the other neighbouring Molucca islands. And, according to Lesson, it is very common in the islands of the Asiatic Archipelago, and especially at New Guinea. Cuvier relates that the bird lays a small number of green eggs, which it abandons to the heat of the climate.

THE CASSOWARY.*

This bird is stated by travellers to attain a height of more than seven feet, and its average in captivity may be estimated at between five and six. In form it closely resembles the ostrich, but is lower in the legs, shorter in the neck, and of a more thick-set and clumsy make. At a distance, its feathers have more the appearance of hair than of plumage.

In a state of nature, this bird is very fleet, and affords much sport in coursing with dogs, which are, however, shy of their game, in consequence of the painful kicks which the bird can inflict. So powerful are they, according to the settlers, that the bird can break a man's leg by striking out with its feet. Well-trained dogs, therefore, to avoid this infliction, run up abreast, and make a sudden spring at the neck of the bird.

Though the Cassowary has bred so frequently in captivity, the mode of making the nest in the wild state does not appear to be well known. It is generally supposed to be a mere hollow excavated in the earth. The dark green eggs are six or seven in number. The birds appear to be tolerably constant in pairing, and the male bird sits and hatches the young, whilst the female watches and guards the nest.

These birds will take water. Captain Sturt, when descending the Murrumbidgee, in Australia, saw two of them in the act of swimming. They appear to be gregarious, and not very shy in some localities. Major Mitchell, in his excursion towards Port Phillip, found them very numerous on the open downs, and their curiosity brought them to stare at the horses of the party, apparently unconscious of the presence of the riders. In one flock he counted thirty-nine, and they came so near, that the traveller, having no rifle with him, discharged a pistol at them, but without effect.

The body of the cassowary is very heavy; and its wings are so short that it has no power to raise itself from the ground in flight. The quills of which the wings are composed are five in number: they are strong, distinct from each other, and without barbs. The beak is about five inches long, of a very hard substance, and somewhat curved. There is a bony protuberance, covered with horn, and of a blackish-brown colour, on the top of the head. The skin of the head and neck is entirely naked; it is of a fine blue colour above and red below. On each side of the front of the neck hangs a long, light blue wattle. The body is covered with black feathers, which, at a little distance, appear like hairs. So long are those on the hinder part of the back, that they entirely conceal the tail. The thighs are covered with feathers almost to the knees. The legs are remarkably stout; the toes of each foot are only three in number; and the nail of each internal toe is about twice the length of any of the others.

A cassowary that was kept, some years ago, in the menagerie at Paris, devoured every day between three and four pounds weight of bread, six or seven apples, and a bunch of carrots. All its food was swallowed without being bruised. In summer it drank about four pints of water in the day, and in winter somewhat more.

This bird was sometimes ill-tempered and mischievous. It was greatly irritated when any person approached it dressed in red clothes, or of a dirty and ragged appearance; and it frequently attempted to strike them by kicking forwards with one of its feet. It has been known even to leap out of its inclosure, and to tear the legs of a man with its claws.

A cassowary, at the same time, in Exeter Change, could not be regarded as an ill-tempered bird. It was driven many times out of its cage, every day, by its keeper, for the inspection of visitors. It ran without any apparent concern, for some time, about the room, and allowed even strangers to handle it without any resistance; and after a while it returned quietly to its cage.

Ordinarily this bird appears to be dull; and its disagreeable voice and hard black flesh offer no

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* Dromaius Novæ Hollandiæ.

THE EMEU.

compensation for the cost of rearing and supporting it. The wild cassowary feeds on fruits, tender roots, and occasionally on the young of small animals. The tame ones which have appeared in our Zoological Gardens are fed not only on fruits, but on bread, of which each one receives about four pounds a-day.

These birds run very swiftly, and often outstrip the fleetest horses. They resist dogs by dealing them very severe blows with their feet. The male bird generally leaves his mate to the cares of incubation, which are required only at night; for, during the day, the three grayish eggs, spotted with green, are exposed to the vivifying heat of the sun, being slightly covered with sand in the hole where they were laid. In captivity, their incubation lasts eight-and-twenty days.

There appears to be but little difference in colour between the two sexes; but the young, on first quitting the shell, have a much more elegant livery. A brood of these birds was hatched, some years ago, in the Zoological Gardens in the Regent's Park. Their ground colour was grayish-white, marked with two longitudinal broad black stripes along the back, and two similar ones on either side, each sub-divided by a narrow middle line of white. These stripes were continued along the neck without sub-division, and were broken on the head into irregular spots. Two other broken stripes passed down the fore part of the neck and breast, and terminated in a broad band passing on either side across the thighs. The bill and legs were of a dusky hue, as in the fully-grown bird. The young bird has not the helmet of the adults, and his plumes are of a light red colour, mixed with gray.

THE APTERIX.*

THIS is an exceedingly curious bird. In 1812 Captain Barclay, of the ship "Providence," brought a specimen from New Zealand, and presented it to Dr. Shaw. On the death of that eminent man it came into possession of the late Earl of Derby, the president of the Zoological Society of London, distinguished for his munificent patronage of zoology, and for his beautiful and valuable collection, both of living animals and preserved birds. A specimen has lately been added to the gardens of the Zoological Society.

THE APTERIX.

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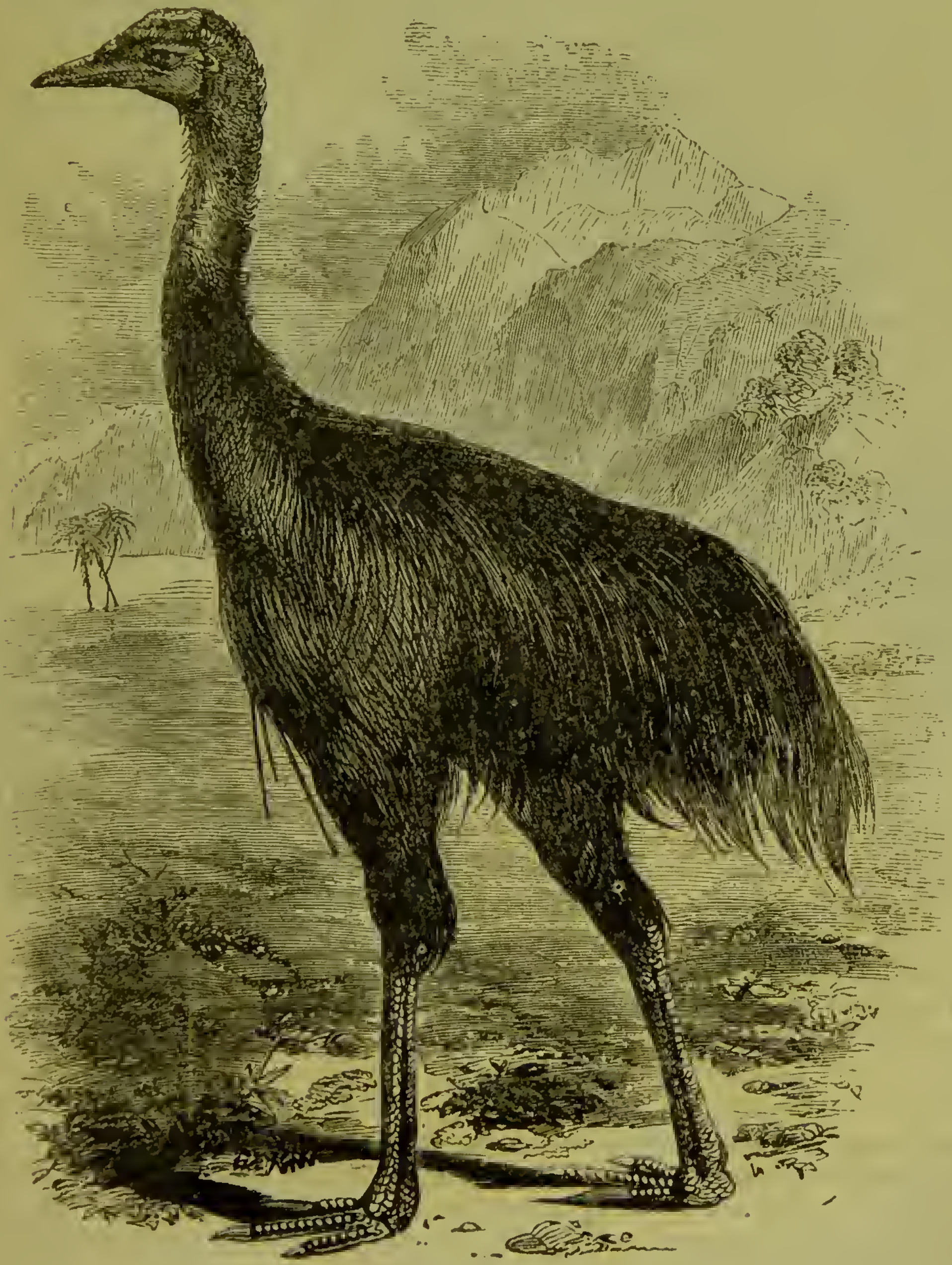
* Apterix Australis.

Though the Apterix has no wings, yet there are small members growing out of the part of the body from which the wings of birds arise. The feathers are soft and flexible, and furnished with extremely fine hair, so that the covering of the Apterix has, at a distance, exactly the appearance of coarse fur.

The length from the point of the bill to the end of the tail-less body is about thirty-two inches; but the bill varies greatly in length, and it is supposed that the female has the longer bill. It appears that worms, insects, and probably snails, are the food of this species.



THE MOORUK

Mr. Gould has become acquainted with several specimens of this bird. He states that its favourite localities are those covered with extensive and dense beds of fern, amongst which it conceals itself, and when hard pursued by dogs, the usual mode of chasing it, it takes refuge in the crevices of rocks, hollow trees, and the deep holes which it excavates in the ground in the form of a chamber. In these latter situations it is said to construct its nest of dried ferns and grasses, and there deposits its eggs.

This bird is called "Kiwi" by the natives of New Zealand, who hunt it for the sake of its flesh, of which they are extremely fond. Until the approach of night it buries itself in the recesses of the forests, and then ventures forth, in couples, in search of food, which they discover in darkness with the greatest ease. The cry of this bird resembles the sound of a whistle, and it is by imitating this that the hunters are able to take it. Sometimes it is chased by dogs, and at others secured by suddenly coming upon it with a lighted torch, when it makes no attempt at flight.

THE MOORUK.*

THE Mooruk is a species of Cassowary. One was procured by Dr. Bennett from the natives of New Britain, an island in the South Pacific Ocean, near to New Guinea, where it is known by that name. Its height was three feet to the top of the back, and five feet when standing erect; its colour was rufous, mixed with black on the back and hinder portions of the body, and raven-black about the neck and breast; the loose, wavy skin on the neck being beautifully coloured with iridescent tints of bluish purple, pink, and an occasional shade of green. It had a horny plate on the top of the head, resembling mother-of-pearl darkened with blacklead; and behind this was a small tuft of black, hair-like feathers, continued, in more or less abundance, over the greater part of the neck. The bird was very tame and familiar, and, when in a good humour, frequently danced about its place of confinement. It was fed on boiled potatoes, and occasionally on meat. The bird appeared to Dr. Bennett to approximate nearer to the emeu than to the cassowary, and to form the link between them.

THE DODO.

THE visitors of the British Museum were, some years ago, accustomed to glance at the representation of a bird, the gift of Mr. George Edwards, which he thus describes:—"The original picture from which this print of the Dodo is engraved, was drawn in Holland, from the living bird, brought from St. Maurice's Island, in the East Indies, by the way of the Cape of Good Hope. This picture was the property of the late Sir Hans Sloane to the time of his death; and afterwards becoming my property, I deposited it in the British Museum, as a great curiosity. The above history of the picture I had from Sir Hans Sloane, and the late Dr. Mortimer, Secretary of the Royal Society."

Were this the only evidence that could be adduced, it would be more easy to suppose that the artist had invented the picture than that a species of birds should have become extinct in so short a space of time. But there are three other representations of the dodo in very early printed books, and they are evidently not copied from one another, though they all agree in representing the animal with a sort of hood on the head, the eye placed in a bare skin extending to the beak, the curved and swelling neck, the short heavy body, the small wings, the stumpy legs and diverted claws, and the tuft of rump feathers.

Hubert thus describes the bird in his "Travels:"—"The dodo comes first to our description, here, and in Dygarrois (and nowhere else, that ever I could see or hear of, is generated the dodo; a Portuguese name it is, and has reference to her simpleness); a bird which, for shape and rareness, might be called a phœnix (wer't in Arabia); her body is round and extreame fat, her slow pace begets that corpulencie; few of them weigh less than fifty pound: better to the eye than the stomak: greasy appetites might, perhaps, commend them, but to the indifferently curious nourishment but proves offensive. Let's take her picture: her visage darts forth melancholy, as sensible of Nature's injurie in framing so great and massive a body to be directed by such small and complementall wings, as are unable to poise her from the ground, serving only to prove her a bird, which otherwise might be doubted of; her head is variously drest, the one halfe hooded with downy blackish feathers, the other perfectly naked, of a whitish hue, as if a transparent lawne had covered it; her bill is very hooked, and bends downwards; the thrill, or breathing place, is in the midst of it, from which part to the end the colour is a light green, mixt with a pale yellow; her eyes be round and small, and bright as diamonds; her cloathing is of finest downe, such as you see in goslins; her trayne is, like a China beard, of three or four short feathers; her legs thick, and black, and strong; her tallons, or pouncers, sharp; her stomak fiery hot, so as stones and iron are easily digested in it, and, in that shape, not a little resembling the Africk ostriches; but so much, as for their more certain difference, I dare to give thee (with two others) her representation."

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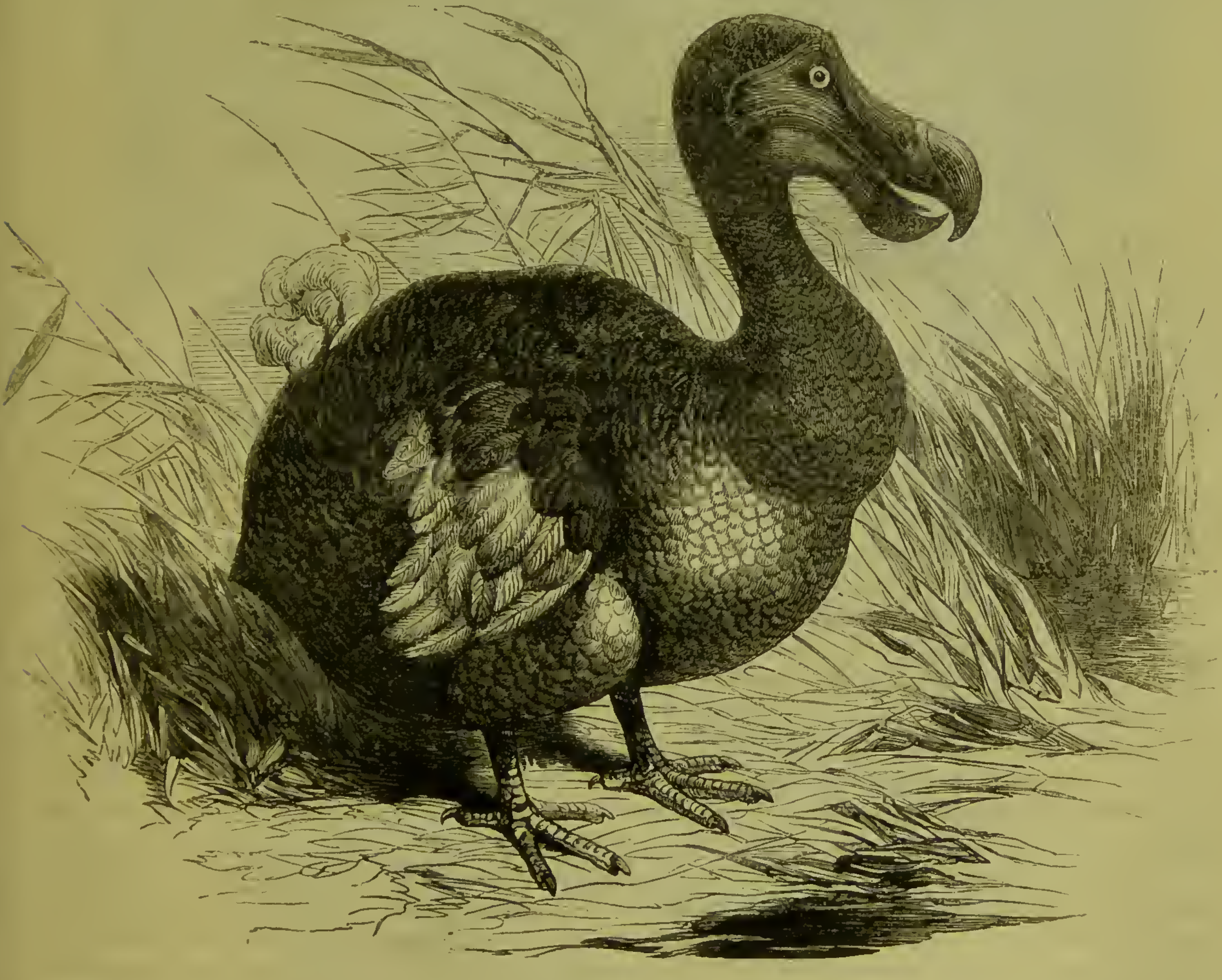
* Casuarius Bennetti.

There are several details in this description, such as the digestive powers of the stomach, which are doubtless inaccurate; but the more important particulars entirely accord with other evidence.

The bird in question, from every account which we have of its economy, and from the appearance of its head and foot, is decidedly gallinaceous; and from the insufficiency of its wings for the purposes of flight, it may with equal certainty be pronounced to be of the *struthious* structure, and referable to the present family. But the foot has a strong hind toe, and, with the exception of its being more robust—in which character it still adheres to the *Struthionidæ*—it corresponds exactly with the foot of the Linnæan genus *Crax*, that commences the succeeding family. The bird thus becomes osculant, and forms a strong point of junction between these two conterminous groups; which, though evidently approaching each other in general points of similitude, would not exhibit that intimate bond of connection which we have seen to prevail almost uniformly throughout the neighbouring sub-divisions of Nature, were it not for the intervention of this important genus.



THE DODO.

Thus the existence of the dodo is placed beyond all doubt. It appears that there is a general impression among the people of the Mauritius, that this bird did exist at Rodriguez, as well as in the Mauritius itself; but the oldest inhabitants never saw it, nor has a single specimen been preserved by them.

With this bird we conclude our account of the GALLINÆ, often called the RASORES, or RASORIAL BIRDS.

WADING BIRDS.*

"THE habits and manners of birds," says Buffon, "are not so free as might be supposed; their conduct is not the result of a freedom of will or choice, but a necessary effect derived from the conformation, the organisation, and the exercise of their physical faculties. Determined and fixed, each in the manner of life which this necessity imposes, none attempt to infringe it, and none can withdraw themselves from its influence. It is by this necessity, as varied as is the structure of animated bodies, that all the districts of Nature are peopled. The eagle quits not the rock, nor the heron the shore; the one drops from his airy height to carry off or tear the lamb, by no right but that of power, and by no means but those of violence; the other, with his feet sunk in mire, awaits, at the command of necessity, the passage of his fugitive prey. The woodpecker never abandons the trunks of trees, round which he is ordained to creep; the snipe must remain in his marshes; the lark in his furrows; the singing-birds in their groves. Do we not observe all granivorous birds search out inhabited countries, and follow the track of cultivation; while, on the contrary, those which prefer berries and wild fruits invariably shun the footsteps of man, and in the dense wood, or on the solitary mountain steep, bide alone with Nature, which has dictated the laws they shall obey, and furnished them with the means of such obedience? She it is who retains the wood-hen beneath the thick foliage of the fir-tree; the solitary blackbird (*turdus cyaneus*) in the rock; the loriot in the forest, that re-echoes to his cries; while the bustard haunts the dry fallow land, and the rail the humid meadow. These are the eternal, immutable decrees of Nature, as permanent as the forms of her productions. These are her grand and rightful properties, which she never yields nor abandons, even in things which we imagine we have ourselves appropriated altogether; for, let us have acquired them how we may, they are not the less under her dominion. Has she not, for example, quartered upon us such troublesome guests as the rat in our houses, the swallow under our windows, and the sparrow beneath our roofs? And when she calls the stork to the summit of the ruined tower, within whose walls the night-bird has already taken up his abode, does she not seem hastening to resume the possessions which we have usurped for a period, but which she has commissioned the resistless hand of Time to restore to her domain?"

In this enumeration, Buffon has included some of the Wading Birds, which strikingly illustrate the observations he makes. The structure and general conformation of this great family admirably adapt them to the local situation appointed for them, and the nature of their food. The woods, the hills, and the verdant plains are not their portion, neither is the sea, nor the larger rivers and lakes, on the surface of which, far away from the shore, so many revel in a congenial element; but theirs are the swamp, and the morass, and the low and oozy lands which border the sea and its petty creeks and inlets. Here they find their food, which consist of the smaller fishes, reptiles, snails, insects, and water-plants. Their legs are accordingly of great length, the thighs often bare of feathers for a considerable distance, and the toes either long and spreading, or partially webbed; many, if necessity requires, can swim, and some few swim and dive with great dexterity.

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* Grallatores.

THE COMMON CRANE.

In proportion to the length of their legs is that of the neck, or at least generally so: and where the neck does not bear a due relative proportion, its length is usually made up by that of the beak; but in many, as the stork or the heron, we find both the neck and the beak equally elongated. In the structure of the beak the wading birds offer much variety, according to the particular nature of the food to be obtained. In many it is long, powerful, and pointed; in others, broad and rounded; and again, in others soft and pulpy at the tip, and supplied with nerves, so as to perform the office of a feeler when inserted into the oozy mud in search of minute insects or seeds. Thus the heron, the spoonbill, the oyster-catcher, and the woodcock, afford examples by way of contrast, in each of which we find this organ so modified as to be consonant to the nature and habits of its possessor.

The order *Grallatores* is very extensive, and includes a vast assemblage of subordinate groups. Besides those on the border-line, it comprehends cranes, storks, herons, ibises, plovers, snipes, sandpipers, and very many more. Our limits will therefore allow only of a general outline, illustrated by some of the best examples, that the main and distinguished features of the whole may be clearly understood.

Nor should it be overlooked, that whatever attraction these birds may present to the scientific ornithologist, they are highly interesting to all who love the study of Nature. The very place they occupy is peculiarly worthy of consideration, as here we may obtain a distinct view of the system that prevails throughout the regions of animated beings. For here may be observed birds which link together the Grallatores with some of the Gallinæ, while others are united with the Natatores, the swimming order of birds, which we shall subsequently contemplate.

One family of wading birds includes those known by the name of Cranes.*

THE COMMON CRANE.†

THE Common Crane is a large bird, measuring upwards of five feet in length. The plumage is, in general, ash-coloured, but the forehead is black; the sides of the head, behind the eyes, and the hind part of the neck, are white; on the upper part of the neck there is a bare ash-coloured space of two inches; and above this the skin is naked and red, with a few scattered hairs. Some parts about the wings are blackish. From the pinion of each wing springs an elegant tuft of loose feathers, curled at the ends, which can be erected at will, but which, when quiescent, hangs over and covers the tail. The legs are black.

This species is found in numerous flocks, in the northern parts of Europe. It is stated by Mr. Nilsson that the crane is seen in Sweden in spring and autumn, and that it goes to the marshes of Scania to breed. Linnæus describes their appearance in Lapland, and Pennant says they also visit Russia and Siberia.

The nest of the crane is made among long herbage, reeds, and the luxuriant vegetation of swampy tracts, and sometimes on insulated ruins. Two eggs are laid, of a pale dull-greenish colour, blotched with brown. The food of this bird consists not only of grain and vegetables, but worms, frogs, and snails. Cranes are said to make great havoc in the corn when it is green. Of their migration Milton says:—

"Part loosely wing the region; part, more wise,
In common, ranged in figure, wedge their way,
Intelligent of seasons; and set forth
Their airy caravan; high over seas
Flying, and over lands with mutual wing
Easing their flight: so steers the prudent crane
Her annual voyage, borne on winds; the air
Floats as they pass, fanned with unnumbered plumes."

Flocks of these birds are seen, at stated times, according to Mr. Gould, in France and Germany, passing northwards and southwards, as the season may be, in marshalled order, high in the air, their sonorous voices distinctly heard even from their elevated course. Occasionally they descend, attracted by newly-sown fields, or the prospect of finding food in marshes, on the borders of rivers, or even the shores of the sea; but generally they continue their flight unchecked towards their destined resting-places.

Willughby says:—"The flesh is very savoury and well tasted, not to say delicate;" and indeed it seems to have been highly prized in former days. Pegge says, in his "Form of Curey:"—"William the Conqueror was remarkable for an immense paunch, and withal was so exact, so nice and curious in his repasts, that when his prime favourite, William Fitz Osborne, who, as dapifer or steward of his household, had the charge of the curey, served him with the flesh of a crane scarcely half roasted, the king was so highly exasperated, that he lifted up his fist, and would have struck him, had not Eudo, who was appointed dapifer immediately after, warded off the blow." At the enthronisation of George Newell, an English archbishop, 204 cranes were served; and in the "Northumberland Household Book," the price of the crane (cranys) is marked sixteen pence. At some ancient marriage-feasts, also, one of the items in the first is, "9 cranes, every crane three shillings and fourpence;" and in the second we find, "Item for a standert, cranes 2 of a dish," for the second course; and in the expenses we find, "Item in cranes, 9 . . £0 30s. 0d." The long drooping feathers of cranes are valuable as plumes.

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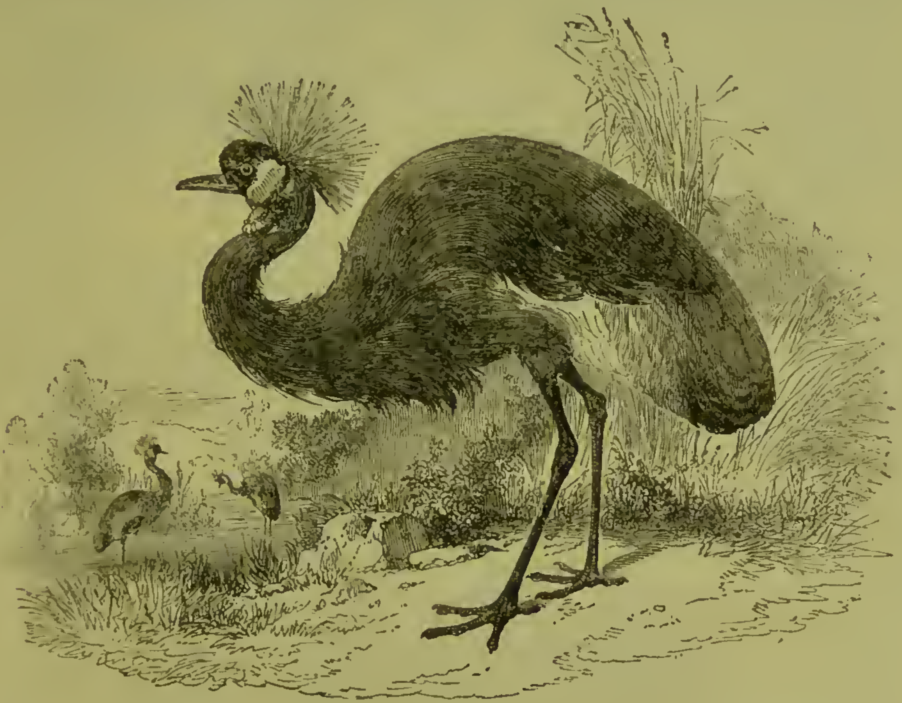
* Gruidæ.

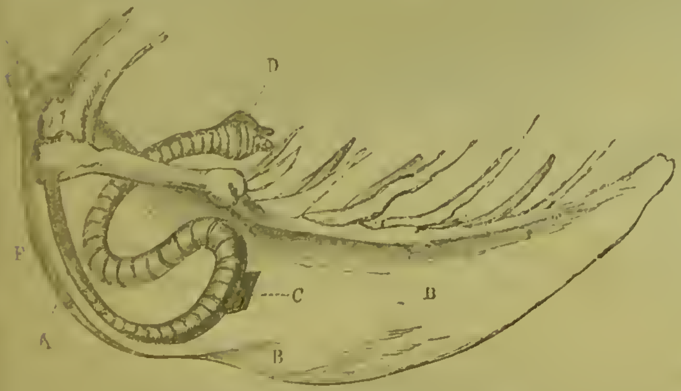
† Grus cinerea.

THE CROWNED CRANE.*

This bird is considerably larger than the demoiselle crane, and though less graceful in form and attitude it is far more elegant in the varied colours of its plumage. It measures, when fully grown, about four feet in total height. The cheeks and temples are entirely naked, and are covered with a bright rosy red, which sometimes overspreads the whole of the naked surface, and sometimes is confined to a portion of it. A similar naked space beneath the upper part of the throat is gradually developed, and terminates in a fold of skin resembling the wattle of a turkey. A close tuft of short, smooth, even, velvety, deep-black feathers covers the fore part of the head, and behind them rises a very remarkable crest, each filament of which is twisted spirally on itself, is fringed along its edges with a series of black-pointed hairs, and terminates in a blackish pencil. The bill, legs, and feet are of a dusky-black. The iris is remarkable for being almost destitute of colour.



THE CROWNED CRANE.



ORGANS OF THE DEMOISELLE CRANE.

The voice of the crane—and the remark applies more or less to the whole family—may be heard while the bird is out of sight, its being singularly loud and sonorous. The peculiarity, in this instance, consists in convolutions of the trachea before entering the chest. Thus, as the engravings will show, the trachea, instead of going directly into the chest, enters a large cavity between the two plates forming the keel of the breast-bone, and is there doubly reflected before it emerges and ascends to pass into the chest.

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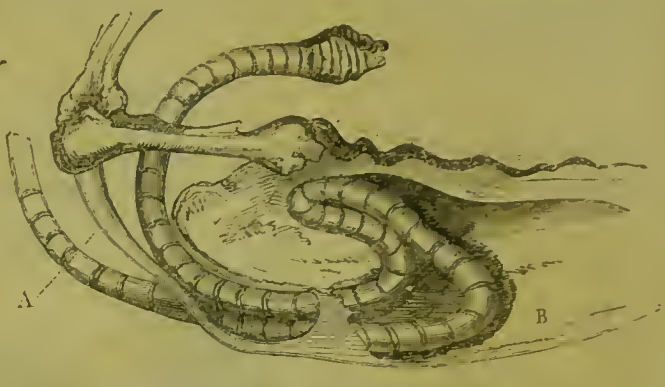
* Ardea pavonina.

The first represents the breast-bone and trachea of the young demoiselle crane. Here the tube F, quitting the neck, passes between the branches of the merrythought (*furcula*), A, to the inner edge of the keel of the breast-bone, B B, which is grooved to admit the fold. In this groove the fold of the trachea is bound by the cellular membrane: at the point C a small portion of the bone is sawed away to show the depth of the groove which receives the trachea. D is the inferior larynx.

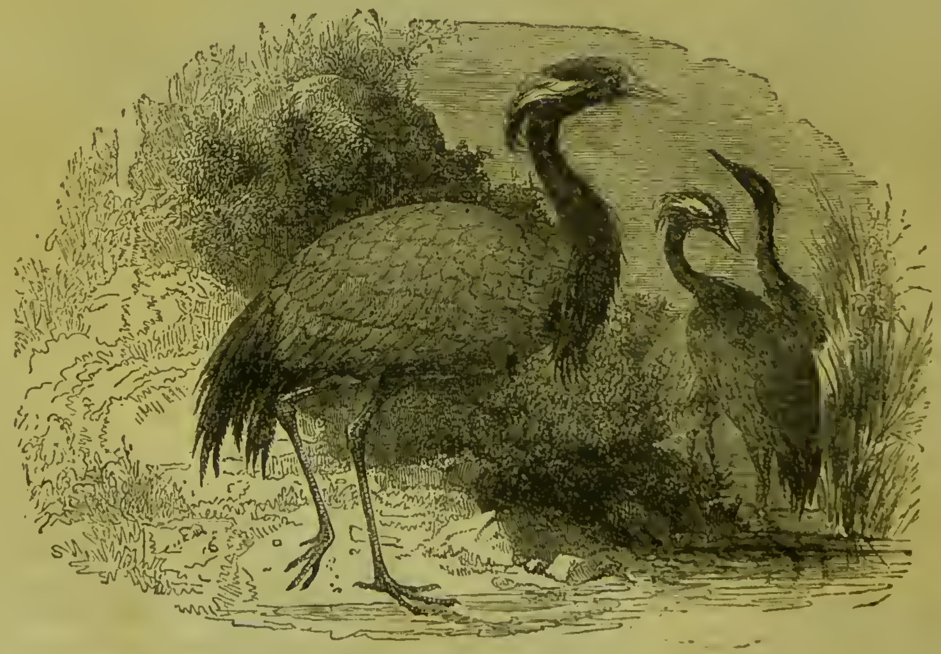
The following engraving exhibits the trachea in the common crane, running a convoluted course in a cavity in the substance of the keel of the breast-bone, between the two plates comprising it, one of which is cut partially away to expose the course of the tube. In this, as in the preceding, the *furcula*, A, is not, as in most birds, a distinct bone, but is solidly united to the keel of the breast-bone, B.



ORGANS OF THE COMMON CRANE.

THE DEMOISELLE.*

The elegant species to which the name of Demoiselle was given by the French Academicians, is remarkable for its graceful symmetry of form, the tasteful disposition of its plumage, and the agreeable contrast of its lighter and darker shades of colour. It measures, when fully grown and in an upright position, about three feet six inches to the top of the head; and its length, from the point of the bill to the tip of the tail, is about three feet.



THE DEMOISELLE.

Of these measurements, the neck and legs form a very considerable proportion. The whole of the upper surface of the head is occupied by a patch of light gray; and the sides of it, together with the neck, including the long slender-pointed feathers which depend from its lower part over the breast, are

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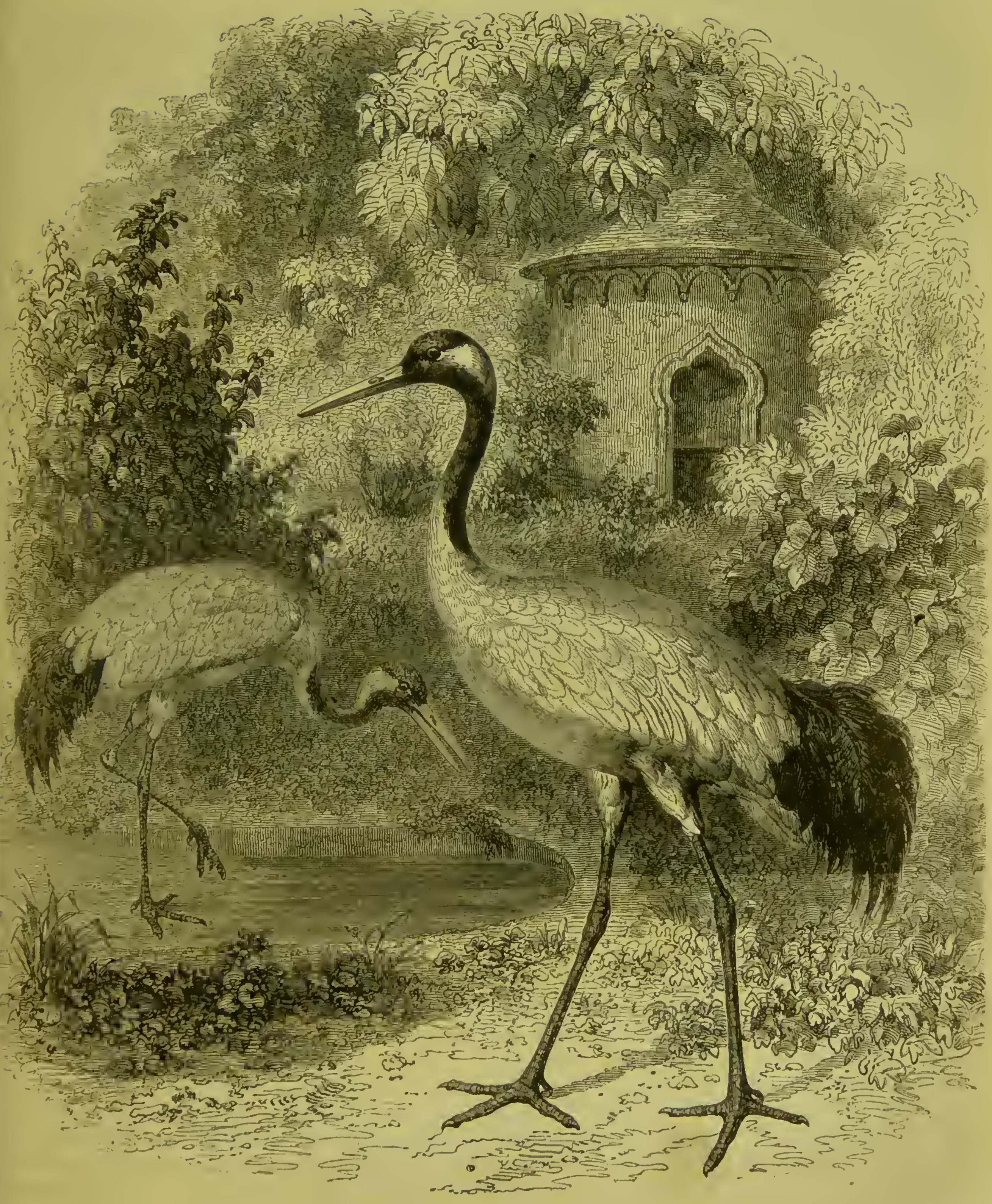
* Anthropoides virgo: Vieillot.



THE MANTCHOURIAN CRANE.

of a uniform, but not very intense, shade of black. A tuft of pure white feathers passes off backwards from behind each eye. Except the outer halves of the quill-feathers of the wings and tail, the rest of the plumage is of a slaty-gray. When the wings are folded, the secondary quill-feathers form on either side of the body a tuft of dependent plumes, curving downwards. The outer halves of all the quill-feathers are of a dusky-black.

Like the cranes in general, the demoiselle is migratory in its habits. It is a native of Africa. It extends along the Mediterranean and western coasts from Egypt to Guinea, but is most abundant in the neighbourhood of Tripoli, and throughout the neighbouring region. It arrives in Egypt in considerable numbers, at the time of the inundation of the Nile, and appears in Constantinople in the month of October, being then probably on its passage from the Black Sea towards the south. It is also stated to have been met with at the Cape of Good Hope, and in the interior of Africa.

This beautiful bird has frequently been brought into England, the climate of which it bears extremely well. It soon becomes familiarised. Several fine specimens are in the Gardens of the Zoological Society. In France it has bred in captivity; some of the young birds live for twenty-four years.

THE MANTCHOURIAN CRANE.*

The locality of this bird, formerly supposed to be Japan, is now known positively to be the country north of Pekin. M. de Montigny took some specimens to Paris, on his return from China, in 1854, and these have not only continued in health, but for three successive seasons a nest has been made, and the young hatched.

Sir John Bowring sent a pair of these favourite birds of the Chinese to Her Majesty the Queen, which, after living in the Royal collection for some years, were graciously presented to the Zoological Society in 1857, and in these gardens may, at any time, be seen.

Another family† contains many groups, varying from each other in certain details, but all agreeing in general characteristics. They are strictly carnivorous, living on fish and reptiles, which frequent the borders of lakes or marshes. Essentially formed for wading, their limbs and neck are long, but the beak varies considerably, according to the manner in which the food is to be obtained. The toes are generally long and slender, so as to cover a wide area, and thus keep the bird from sinking into the oozy mud; and the inner edge of the claw of the middle toe is mostly pectinated.

THE HERONS.

The Herons are to be found in all quarters of the globe, but they seldom occur in very cold regions. The bill of these birds is much longer than the head, as large as it is high, or larger, at the base; the upper mandible is nearly straight. So it is with the Scopolaceous Heron.‡

The common heron, whether male or female, after the third year, has long, loose, black feathers on the back of the head; similar plumes of a lustrous white depend from the lower part of the neck; the equally elongated and subulate scapulars are of a silvery ash. The forehead, neck, middle of the belly, and border of the wings and thighs are of a pure white; the occiput sides of the breast and flanks are deep black. On the front of the neck are large longitudinal black and ash spots. The back and wings are very pure bluish ash; the bill is a deep yellow; the iris yellow; the naked skin of the eye bluish purple; the feet are brown, but of a lively red towards the feathered part. The length is three feet and upwards.

Deadly feuds sometimes take place between the herons and the rooks, arising in a dispute for the possession of the nest-trees. One of them occurred at Dallam Tower, in Westmoreland, originating in the felling of the fine old oaks occupied by the herons, and their consequent attempt upon the grove in the tenure of the rooks. The herons had the best of the fray for two successive seasons, and at length a sort of peace was made between the two combatants; the herons and the rooks severally setting up their nest on a particular part of the now only remaining grove, and leaving the other moiety to their former antagonists.

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* Grus montignesia.

† Ardeidæ.

‡ Ardea helias: Linnæus.

THE GREAT WHITE HERON.*

This tall and elegant bird principally inhabits the regions of the South, being found from Guiana, and probably beyond the line, to New York. It enters the territories of the United States late in February. The high inland parts it rarely or never visits; its favourite haunts being vast, inundated swamps, rice-fields, the low, marshy shores of rivers, and similar places, where, from its size and colour, it is very conspicuous, even at a great distance.

The appearance of the Great White Heron, during the first season, when it is entirely destitute of the long flowing plumes of the back, is so different from that of the bird in its full plumage, which it obtains in the third year, that naturalists and others generally consider them as two species.

This bird breeds in several of the extensive cedar-swamps in the lower parts of New Jersey. Their nests are built in societies, on the trees. The eggs are usually four, of a pale-blue colour. In the months of July and August the young make their first appearance in the meadows and marshes, in parties of twenty and thirty together. The large ditches with which the extensive meadows below Philadelphia are intersected are, about that season, regularly visited by flocks of these birds; these are frequently shot, but the old birds are too sagacious to be easily approached. Their food consists of frogs, lizards, small fish, insects, seeds of the splatterdock (a species of *nymphæ*), and small water-snakes.

THE SCOPOLACEOUS HERON.

The long plumes of these birds have, at various periods, been in great request in Europe, particularly in France and Italy, for the purpose of adorning head-dresses.

Of Bitterns a genus† has been formed, including several species. They differ from the herons in building on the ground, among reeds, osiers, or the luxuriant vegetation of swamps, where they remain concealed during the day.

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* Ardea egretta.

† Botaurus.

THE BITTERN.*

The provincial English names of this bird, such as "Mere-drum," and "Bull of the frog," as well as many of its foreign appellations, allude to the bellowing or drumming noise for which it is remarkable. This deep note of the "hollow-sounding bittern" is heard at the breeding season, about February or March.

As the day declines, the bittern leaves its haunts, and rising spirally, soars to a great height in the twilight. Ordinarily it flies very heavily, like the heron, uttering from time to time a resounding cry.

The Bustards, forming a separate genus,† live generally in open countries, preferring plains or extensive downs dotted with low bushes and underwood, where an enemy may be descried from afar, and from whence they can run with exceeding swiftness, using their wings, like the ostriches, to accelerate their course. When they do take wing their flight is low, and they skim along the ground with a sufficiently sustained and rapid flight. Their food consists of vegetables, insects, worms, grain, and seeds.

WHITE HERONS.

They are polygamous, one male sufficing for many females. It appears that the males in the greatest number of species differ from the females in having extraordinary ornaments, and in possessing a more variegated plumage. They are said to moult twice a-year. Their massy port, and the slightly arched and vaulted upper mandible of the beak, and the little webs between the bases of their toes, recall the form of the gallinaceous birds; but in other respects, as in the nudity of the lower part of the legs, their whole anatomy, and even the flavour of their flesh, the differences are great and decisive.

THE GREAT BUSTARD.‡

The Great Bustard is found in some provinces of France, and in parts of Germany and Italy. It is common in Russia, and on the extensive plains of Tartary. It is very abundant in some parts of Spain and Portugal, and it is dispersed over the more temperate parts of Africa.

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* Botaurus stellaris.

† Otis.

‡ Otis tarda: Linnæus.

THE LITTLE BUSTARD.[*]

The favourite localities of this bird are the arid plains of Spain, Italy, and Turkey; it is also found—though more sparingly—in the South of France; but in the northern parts of the Continent it is never seen. Its body is somewhat larger than that of a pheasant; and its manners and food are precisely those of the great bustard.

THE BITTERN.

THE ASIATIC BUSTARD.[†]

Mr. Gould has given a magnificent representation of this bird, which was brought from the Highlands of the Himalaya, but it is not confined to that locality. Colonel Sykes observed it in the wide and open country of the Mahrattas, where it lives in large flocks, and is considered one of the greatest delicacies as an article of food. So abundant are they in the Deccan, that one gentleman shot nearly a thousand of these birds.

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[*] Otis tetrax.

[†] Otis nigriceps.

The length of the male bird of this species, inclusive of tail, is 56½ inches. The female resembles it in plumage, but is only 41 inches, including the tail. The male is furnished with the gular pouch.

Colonel Sykes found an egg in a hole in the earth on the open plain, and that considerably advanced in the process of incubation. In shape it was a perfect oval; and in colour a brown olive, with obscure blotches of darker brown olive.

AFRICAN BUSTARDS.

Le Vaillant discovered one species* inhabiting the Caffre country, and some parts of the colony of the Cape of Good Hope.

THE LITTLE BUSTARD.

Another species,† met with by Major Denham, near the larger towns, did not occur in any great abundance. It frequented moist places, where the herbage was pure and fresh, and where it was taken in snares by the natives for food. It was almost invariably seen singly, Major Denham only once having observed a pair together. It was always found in company with gazelles. That gentleman praises its large and brilliant eyes. The Arabs are accustomed to compare the eyes of their most beautiful women to those of the *Oubara*, which seems to be a general name for the bustards of Africa.

A third species was discovered by Mr. Burchell, in South Africa,‡ which stood upwards of five feet in height, and may be regarded as the most gigantic development of the four hitherto observed. "We shot," Mr. Burchell says, "a large bird of the bustard kind, which was called *Wilde Paauw* (wild peacock). This name is here very wrongly applied, as the bird to which it properly belongs differs from this in every respect. There are, indeed, three, or perhaps four, birds to which, in different districts, this appellation is given. The present species, which is called Kori in the Sichuana language, measured, in extent of wing, not less than seven feet, and in bulk and weight was almost greater than some of the people could manage. The under part of the body was white, but the upper part was covered with fine lines of black on a chestnut-coloured ground. The tail and quill-feathers partook of the general colouring of the back; the shoulders were marked with large blotches of black and white, and the top of the head was black; the feathers of the occiput were elongated into a crest; those of the neck were also elongated, loose, narrow, and pointed, and were of a whitish colour, marked with numerous transverse lines of black."

HEAD OF OTIS HOUBARA.

The *Otis Houbara* inhabits the north of Africa, and appears occasionally in Europe. It is remarkable for its crest.

The Storks form another genus,§ characterised by a long, sharp, powerful, cylindrical beak, unimpressed with furrows; a naked skin surrounding the eyes; long tarsi, the toes before being united by a membrane as far as the first joint; short claws, without any trace of pectinated edges; and ample rounded wings.

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* Otis cærulescens. † Otis Denhami. ‡ Otis kori. § Ciconia.

THE WHITE STORK.*

The White Stork generally stands from three feet and a half to four feet in height, including its neck. The legs are exceedingly long, and do not appear sufficiently thick for the bulk they sustain; the feet are webbed; the beak is straight, long, pointed, and compressed. The stork walks slowly, and with measured steps; but its flight is powerful and long-continued, and it is accustomed to traverse the higher regions of the air.

> "Where the Rhine loses its majestic force
> In Belgian plains—won from the raging deep
> By diligence amazing, and the strong
> Unconquering hand of Liberty—
> The stork-assembly meets; for many a day
> Consulting deep and various, ere they take
> Their arduous voyage through the liquid sky.
> And now, their route designed, their leaders chose,
> Their tribes adjusted, clean'd their vigorous wings,
> And many a circle, many a short essay,
> Wheel'd round and round, in congregation full
> The figur'd flight ascends, and, rising high
> The aërial billows, mixes with the clouds."†

THE WHITE STORK.

Storks are thus birds of passage. They spend the winter in the deserts of Africa and Arabia, and in summer return to towns and villages in colder latitudes, where they build their nests on the summits of old towers and belfries, on the chimneys of the highest houses, and sometimes in dead trees. In marshy districts, where the services of the bird in destroying reptiles are of great value, the people fix an old cart-wheel, by the nave, in an horizontal position, to the extremity of a long perpendicular pole—an accommodation which seems so very eligible to the birds, that they rarely fail to construct their capacious habitation on such platforms.

The nest is a large cylindrical structure, built very strongly and durably with sticks, twigs, and strong reeds, and lined on the inside with fine dry herbs, mosses, and down gathered from the bushes. These fabrics last many years, and to them the faithful pairs annually direct their unerring course from the far-distant regions, to deposit their eggs, and to rear their young.

There are several references in the Scriptures to the bird now under consideration. Thus one of the inspired writers says, "As for the stork, the fir-tree is her house;" and it is stated by Doubdan that the fields between Cana and Nazareth are covered by numerous flocks of them, each flock containing, according to his computation, more than a thousand. In some parts the ground is entirely whitened by them; and, on the wing, they darken the air like a congeries of clouds. At the approach of evening they retire to roost in the trees.

Jeremiah the prophet alludes to the annual migration of the stork. He speaks of it as "in the heaven," expressing in this way the astonishing flight of this bird when she starts for distant regions, and the amazing height to which she soars. He says, also, that the stork "knoweth her appointed time." To this fact Shaw alludes, and states that for about the space of a fortnight before these birds pass from one country to another, they "constantly resort together from all the circumjacent parts in a certain plain; and there forming themselves, once every day, into a *douwanne*, or council, according to the phrase of Eastern nations, are said to determine the exact time of their departure, and the place of their future abode."

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* Ciconia alba.

† Thomson.

In Bagdad, and some other of the remote cities of Asiatic Turkey, the nests of storks present a very remarkable appearance. The towers of the mosques at Constantinople, and most other parts of Turkey, are tall round pillars, surmounted by a very pointed cone; but at Bagdad the absence of this cone enables these birds to build their nests upon the summit; and as the diameter of the nest generally corresponds with that of the tower, it appears as a part of it, and a regular termination to it. The curious effect is not a little increased by the appearance of the bird itself in the nest, which thus, as part of the body and its long neck are seen above the edge, appears the crowning object of the pillar.

The Turks hold the bird in high esteem; and the stork, in cities of mixed population, rarely or never builds its nest on any other than a Turkish house. Thus, the Rev. J. Hartley remarks:—"The Greeks have carried their antipathy to the Turks to such a pitch, that they have destroyed all the storks in the country. On inquiring the reason, I was informed, 'The stork is a Turkish bird; it never used to build its nest on the house of a Greek, but always on that of a Turk.' The tenderness which the Turks display towards the feathered tribes is indeed a pleasing trait in their character."

In all countries where the stork breeds, as in Holland and Germany, it is protected, boxes being provided on the tops of the houses; and in many continental cities it is deemed a favourable omen for a man when a stork selects his roof as its periodical resting-place. Here it will remain for many successive years, the sagacious tenants of the nest returning, from time to time, with unfailing precision.

The eggs vary, being not less than two, and rarely exceeding four. The female covers them with the most tender solicitude, and will rather die than resign her charge. In the battle of Friedland, a farm near the city was set on fire by the falling of a bomb, and the conflagration extended to an old dry tree, on which a pair of storks had built their nest. It was then the season of incubation, and the mother would not quit the nest until it was completely enveloped in flames. She then flew up perpendicularly, and when she had attained to a great height, dashed down into the midst of the fire, as if endeavouring to rescue her beloved progeny from destruction. In one of these descents, enveloped in fire and smoke, she fell into the midst of the burning embers and perished.

The most assiduous care in the rearing of the young succeeds to that of incubation. The parents never lose sight of their brood. One remains in charge of the nest, while the other is abroad searching for serpents, lizards, frogs, or snails. Their teaching the young in their first career through the air is said to present an interesting spectacle.

A variety of passages may be gathered from the writings of the ancients, which show that they regarded the stork as eminent for requiting its parents. Its name in the Hebrew language signifies mercy, or piety; and its English name is taken, if not directly, yet secondarily through the Saxon, from the Greek word *storgé*, which is often used in our language for natural affection.

"The stork's an emblem of true piety;
Because, when age has seized and made his dam
Unfit for flight, the grateful young one takes
His mother on his back, provides her food,
Repaying thus her tender care of him,
Ere he was fit to fly."*

Burcherrode, a Dane, relates what he has seen, and that, it has been remarked, "without the ornaments or the exaggeration of poetry and fable." "Storks build," he says, "in the prefecture of Eyderstede, in the southern part of Jutland; and men may be taught by looking upon them. In a retired part of Eyderstede, some leagues from Toningen, towards the German Sea, there are clusters of trees. Among these they build; and if any creature comes near them in the nesting season, which lasts near three months, they go out in a body to attack it. The peasants never hurt them, and they are in no fear of them.

"The two parents guard and feed each brood, one always remaining on it, while the other goes for food. They keep the young ones much longer in the nest than any other bird, and after they have led them out of it by day, they bring them back at night; preserving it as their natural and proper home.

"When they first take out the young, they practise them to fly; and they lead them to the marshes, and to the hedge-sides, pointing them out the frogs, and serpents, and lizards, which are their proper food; and they seek out toads, which they never eat, and take great pains to make the young distinguish them. In the end of autumn, not being able to bear the winter of Denmark, they gather in a great body about the sea-coasts, as we see swallows do, and go off together—the old ones leading the young ones in the centre, and a second body of the old behind. They return in spring, and betake themselves in families to their several nests. The people of Toningen and the neighbouring coasts gather together to see them come; for they are superstitious, and form certain presages from the manner of their flight. At this time it is not uncommon to see several of the old birds, who are tired and feeble with the long flight, supported at times on the backs of the young; and the peasants speak of it as a certainty, that many of these are, when they return to their home, carefully laid in their old nests, and cherished by the young ones which they reared with so much care the spring before."

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* Beaumont.

THE MARABOU STORK.

The stork is easily tamed, and may be trained to reside in gardens, which it will clear of reptiles and insects. Though grave in its air, it may be roused by example into a certain degree of gaiety.

Hermann relates that he saw some children in a garden, playing at hide and seek: a tame stork joined the party, ran its turn when touched, and distinguished the child whose turn it was to pursue the rest so well, as, along with the others, to be on its guard.

Another instance of sagacity has been recorded. A farmer, in the neighbourhood of Hamburg brought into his poultry-yard a wild stork, to be the companion of a tame one which he had long kept there; but the latter, disliking a rival, beat the wild one so cruelly that he was compelled to take wing, and with some difficulty escaped. A few months afterwards, however, he returned to the poultry-yard, attended by three other storks, when they all fell on the tame stork and killed him.

This stately bird, though a visitor of the continent of Europe, from the north of Spain to Prussia, and particularly common in Holland, is rarely seen in England, except in zoological collections. It was once, however, common; and one of the many evidences of the changes produced by the operations of man is afforded in the extinction of the stork. One or two solitary storks have been shot in England during the present century.

THE MARABOU STORK.*

The Marabou Stork appears to inhabit nearly the whole of tropical Africa. The plumes imported into Europe are chiefly brought from Senegal. It greatly resembles the white stork in its habits, but becomes still more familiar; and in consequence of its large size, it renders far more essential service in removing carrion, offal, and other nuisances.

Smeatham gives an amusing description of a young marabou, which had been domesticated in that part of Africa where he resided. This bird always took its place at dinner-time in the great hall, behind its master's chair, where it remained in expectation of, as usual, sharing the meal. Though the servants carried switches to protect the dishes from its attacks previously to the arrival of the guests, yet, watching its opportunity, it would frequently snatch some favourite morsel before they were aware of it. It has been known in this way to make a single mouthful of an entire boiled fowl. Permitted to fly at large about the island, it roosted very high among the silk-cotton trees, from the tops of which, even at the distance of two or three miles, it would espy the servants carrying the dishes across the yard, and dash down among them as they entered the hall.

When sitting, it was observed always to rest itself on the whole length of the hind part of the leg. It sometimes stood in the room for half an hour after dinner, turning its head alternately, as if listening to the conversation.

It preyed on small quadrupeds, birds, and reptiles, and though it would destroy poultry, it never dared openly to attack a hen with her young ones. It had been known to swallow a cat whole; and a bone of a shin of beef being broken served it for only two morsels.

Its courage was not equal to its voracity, for a child of eight or ten years old was able to put it to flight; though it would seem at first to stand on the defensive, by threatening with its enormous bill widely extended, and crying out with a loud hoarse voice.

There are two other species of gigantic stork, or crane: the Adjutant, or Argala, of Bengal,† and a Javanese species described by Dr. Horsfield.‡

Another genus§ now comes under review.

THE COMMON SPOONBILL.||

The bills of the birds thus denominated are very long and strong, very much flattened, and having the point very much dilated, and rounded into the form of a spoon, or spatula; the upper mandible is channelled, and transversely furrowed at its base. Their feet are long and strong: three toes are anteriorly united up to the second joint by membranes or webs; the posterior toe touches the ground. The wings are moderate and ample; the first quill is nearly as long as the second, which is the longest.

These birds live in society in wooded marshes, generally not far from the mouths of rivers, and are rarely seen on the sea-shore. Their food consists of small fishes, spawn, and small fluviatile testaceous molluscs, as well as small reptiles and aquatic insects.

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* Ciconia marabou: Vigors. † Ciconia argala. ‡ Ciconia Javanica. § Platalea. || P. leucorodia.

According to circumstances, they build their nests either in high trees, in bushes, or among rushes. Their moult is simple and ordinary; but the young bird does not assume the confirmed livery of the adult till the third year.

The bill is gradually developed, and appears covered with a membrane. The crest makes its appearance at the end of the second year. The differences between the sexes are only slightly marked.

These birds are distributed through Europe generally. Holland appears to be a principal place for their summer meetings. Temminck states that the spoonbill has two periods of passage along the maritime coasts, and that it journeys with the storks. As winter approaches, it migrates to more southern regions till the milder weather recalls it.

Mr. Bennett tells us that in winter it takes up its quarters in various parts of Africa, extending southwards even to the Cape of Good Hope. It is rarely met with in inland countries, except on the banks of the larger rivers; but it is by no means uncommon, during the season, on the coasts of the great extent of country which it embraces in its visits.

In England it only appears occasionally. Pennant mentions a large flight which arrived in the marshes near Yarmouth in April, 1774. Colonel Montagu describes it as sometimes seen during the winter on the coast of South Devon, and mentions his receiving two specimens from that part of the country, one in November, 1804, and the other in 1807. Mr. Yarrell records two specimens which were shot in Lincolnshire in 1826.

The flesh of the spoonbill, when well fed and fat, is said to resemble in flavour that of a goose.

Another genus* has the bill strong, large, conical towards the point, and the upper mandible bent at a sudden angle; the lower mandible the larger, and each having serrated edges; the tarsi very long.

THE RED FLAMINGO.†

The remarkable figure and proportions of this bird, as apparent in our engraving, at once indicate its position among the wading birds. The neck is slender and of great length, equalling commonly that of the feet. With a body less than that of a common goose, slender and tapering, it is thus adapted to wade through shallows and morasses with great security. But as the Flamingo frequents the sea-coast and the adjacent marshes, it has also the power of swimming, and its toes are partially webbed; and thus it may fearlessly venture even beyond its depth, nor apprehend being carried away by the retiring tide.

Its food consists of small fish, shells, and water insects, for the capture of which its beak is most singularly constructed; in length it is nearly five inches; the upper mandible is bent downwards in the middle, at an acute angle, as if broken, the space from the angle to the point being a broad flat plate, of a somewhat oval figure; the lower mandible, which is the larger, is so adjusted as to fit the angle with its edges, its under surface being gently arched downwards. The edges of both mandibles are furnished with a row of serrations, or tooth-like eminences, those of the upper being the larger.

The use of the mandibles is, like a strainer, allowing the water to pass through, but retaining any small body, as an insect or a fish. In searching for food among the mud, at the bottom of waters, the upper and not the under mandible is applied to the ground; the flat portion of its surface being well adapted for pressing close down on the soft bed of the marsh or creek. Hence, in that situation, the inferior mandible is placed uppermost, and by its motion works the disturbed and turbid water through the two, as is seen in ducks and other aquatic birds. The tongue is large and fleshy, and the sense of taste is probably acute.

The height of the flamingo, in its natural attitude, is about four feet. The first year, its livery is of a grayish clouded white; the second, the white is purer, but the wings are tinted with a beautiful rose-colour; in the third year it attains its full plumage. Its colour is then extremely rich and brilliant, being of a fine deep scarlet on the back, and roseate on the wings, the quill-feathers of the wings being jet black. The hues of the bird become more intense during succeeding years. A flock of these tall and splendid birds, moving about on the sea-beach, with their plumage reflecting the glowing rays of a tropical sun, is a spectacle never to be forgotten.

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* Phœnicopterus.

† Phœnicopterus ruber: Linnæus.

This bird, known in Europe, has been seen everywhere on the African coast, and the adjacent islands, quite to the Cape of Good Hope. Le Vaillant found thousands of them on the river Klein-Brak, where the water is brackish, owing to the flowing of the tide. It has been occasionally observed on the coasts of Spain, of Italy, and on those of France, which lie on the Mediterranean Sea. It is rare and accidental in the neighbourhood of Rome; and it has been noticed in various parts of the East. There is also an American species of flamingo.*

THE JABIRU.

The Jabiru is partial to salt-water creeks and lagoons. The beak is large, broad, conical, and pointed the lower mandible is slightly curved upwards; its colour is black. The head is large, and neck thick; both the head and neck are of a rich, deep glossy-green, changing, when it reaches the occiput, into beautiful iridescent tints of violet and purple, which, when viewed under a bright sunshine, or in a changing light, gleam with a metallic effulgence equal to that seen in the peacock. Dr. G. Bennett,† to whom we are indebted for this account, describes a jabiru he had at Sydney. It permitted any one to approach it, only moving away timidly when an attempt was made to touch it. It sometimes stood quite erect, or on one leg, with the other thrown out; or rested upon the tarsi, like the emeu and mooruk, and again on one leg, with the bill inclined upon the breast. It greedily devoured 1½ lb. of beef cut in small pieces, on its arrival, but it fed also on fish and reptiles. It picked up the smallest object with great readiness, though its mandibles appear unwieldy, and clattered them together with a loud noise when catching flies. When a tub of water was placed near it, it put one leg in it; and after drinking, filled its mouth with water, and threw it out again, as if rinsing the mandibles. The eyes were very large, and remarkably brilliant, and yet imparted great docility of expression, making it appear —what it was—an amiable bird, familiar with all around it, and courting admiration, but on the watch for any act of aggression. When suddenly startled, it would flap its long and powerful wings, as if preparing for flight, for which its structure seemed well adapted, the whole bulk of the body being so light.

This bird was first placed in a yard where some poultry were kept; he stared at the fowls, and they ran away on his approach, although he did not make the least attempt to molest them; and when striding round the yard, all the poultry fled before him, although it did not appear to be an intentional chase on his part. There happened to be a pugnacious, fussy little bantam-cock in the yard, who would not permit the intrusion of any stranger, and on seeing the jabiru he strutted up with expanded and fluttering wings and ruffled feathers, in a violent state of excitement, cackling and screaming most vehemently, and making efforts, as energetic as so diminutive a bird was capable of, to frighten and drive him out of the yard. The jabiru, with his keen bright eyes, regarded the little fluttering object with cool contempt, and walked about as before; the bantam followed. At last the jabiru turned, and strode after the consequential little creature, as if to crush it under his feet; when the bantam, seeing matters take this serious turn, made off as fast as possible—like all little bullies—and did not again venture to attack so formidable an opponent. In a few days the jabiru became quite domesticated among the poultry, and they evinced no fear; even the little bantam tolerated his presence, but whether from fear or affection, Dr. Bennett did not know.

THE IBIS.‡

Although well-preserved mummies of the Ibis are to be met with in abundance, they appear, if not to have escaped the observation of naturalists, at all events to have been examined without much penetration; and even Blumenbach, the celebrated physiologist of Germany, who examined the bones of the true ibis in a mummy in London, considered them as belonging to the Tantalus ibis—a bird as large as a stork, and with a similar kind of beak. The individual to whom the merit of breaking through this fallacy is due is the traveller Bruce, who used his own eyes, and exercised his own judgment. He at once recognised the true ibis as one which at the present day abounds on the banks of the Nile.

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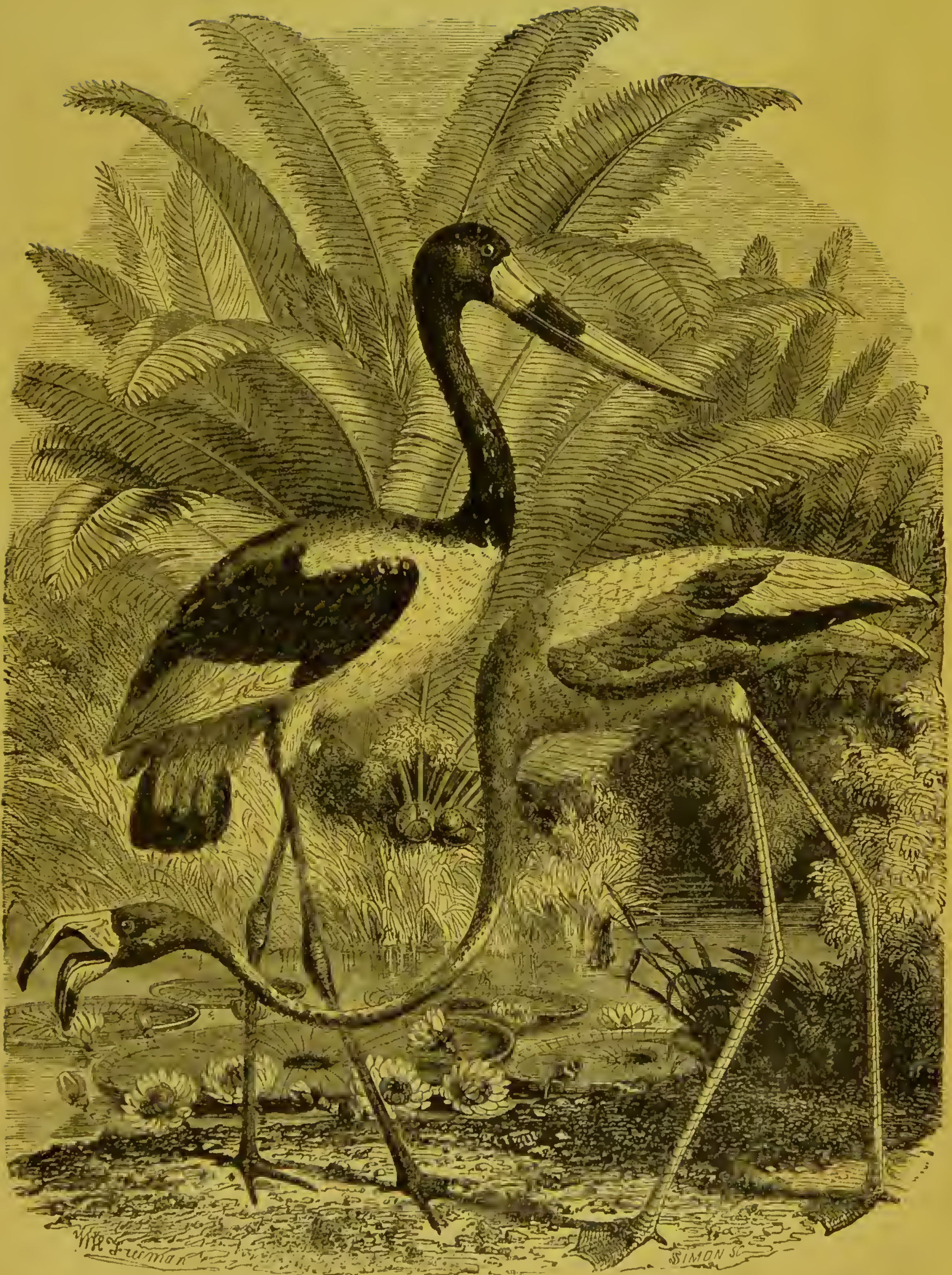
* Phœnicopterus chilensis: Molina.

† "Gatherings of a Naturalist."—Van Voorst.

‡ Numenius ibis: Cuvier.



THE RED FLAMINGO AND THE JABIRU.

THE AFRICAN JACANA.*

The Jacanas are peculiar to the hotter climates of Asia, Africa, and America, and in their general habits closely resemble the moor-hen. They trip over the weeds which mantle the waters with singular ease and grace, searching for the various aquatic insects which constitute their food.

THE IBIS.

Parra Africana.

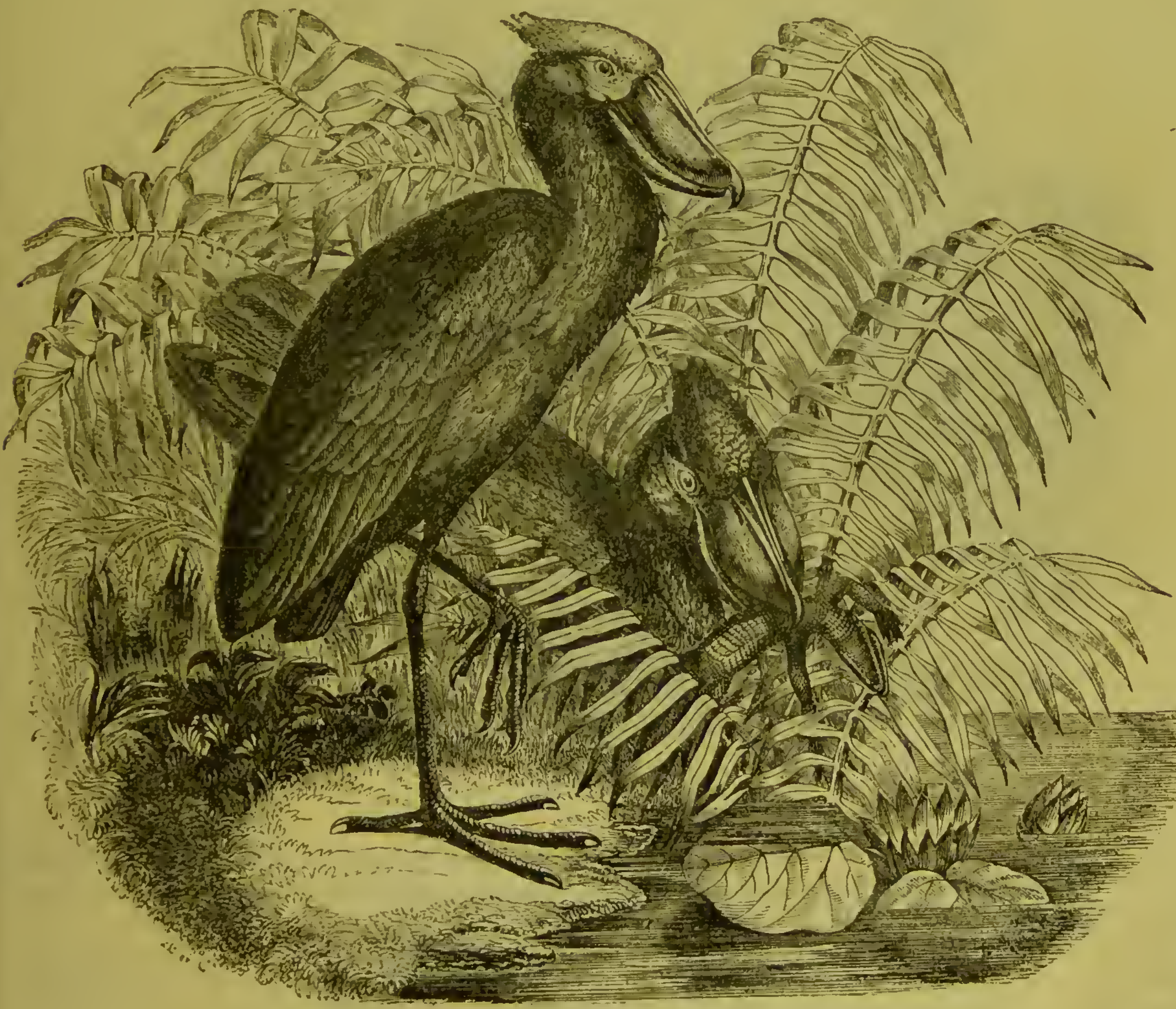
The most beautiful of them all is the Chinese jacana, which is found throughout the whole of India. It appears among the Himalayan mountains, wherever it can secure an asylum in lakes and morasses; and, with two allied species, it is observed on the Ganges, between Calcutta and Benares.

THE AFRICAN JACANA.

Its length is about twenty-two inches. The head, fore part or the neck, and chest, are white; the back of the neck is of a bright orange-colour, divided from the white by a narrow black line; the shoulders are white; the rest of the plumage is of a deep chocolate-brown. The beak and legs are of a dull olive-green.

THE appearance of this bird is very remarkable. Our knowledge of it is due to the indefatigable exertions of Mr. Gould. With its manners we have yet to make an acquaintance. In some respects it will remind the ornithologist of the singular-looking bird called the boat-bill.

The end of the beak and the form of the feet resemble those of the dodo. The beak of this bird* is formed like a spoon, and is very large; it is yellow in the male, and red-brown in the female. The crest is convex, and terminates in a hook at the extremity; it is of a light brown colour, which gradually changes to yellow as it approaches the bill. The nostrils are long. The middle of the lower jaw is membranous. The skin surrounding the eyes is of a yellow colour, and quite free from hair. The eyes are of a clear grayish-brown. The feet are very long, and covered with fine scales, which distinguish this bird from other water fowl, whose feet are generally covered with large and coarse scales. The general colour of the bird is gray, lighter upon the back and feet than at other parts of the body. The feathers at the back of the head are long and of a peculiar form. The tail of the bird resembles that of the jabiru of America. It inhabits the marshy districts of Africa, and subsists upon the fish and small reptiles which there abound.



AFRICAN WATER FOWL.

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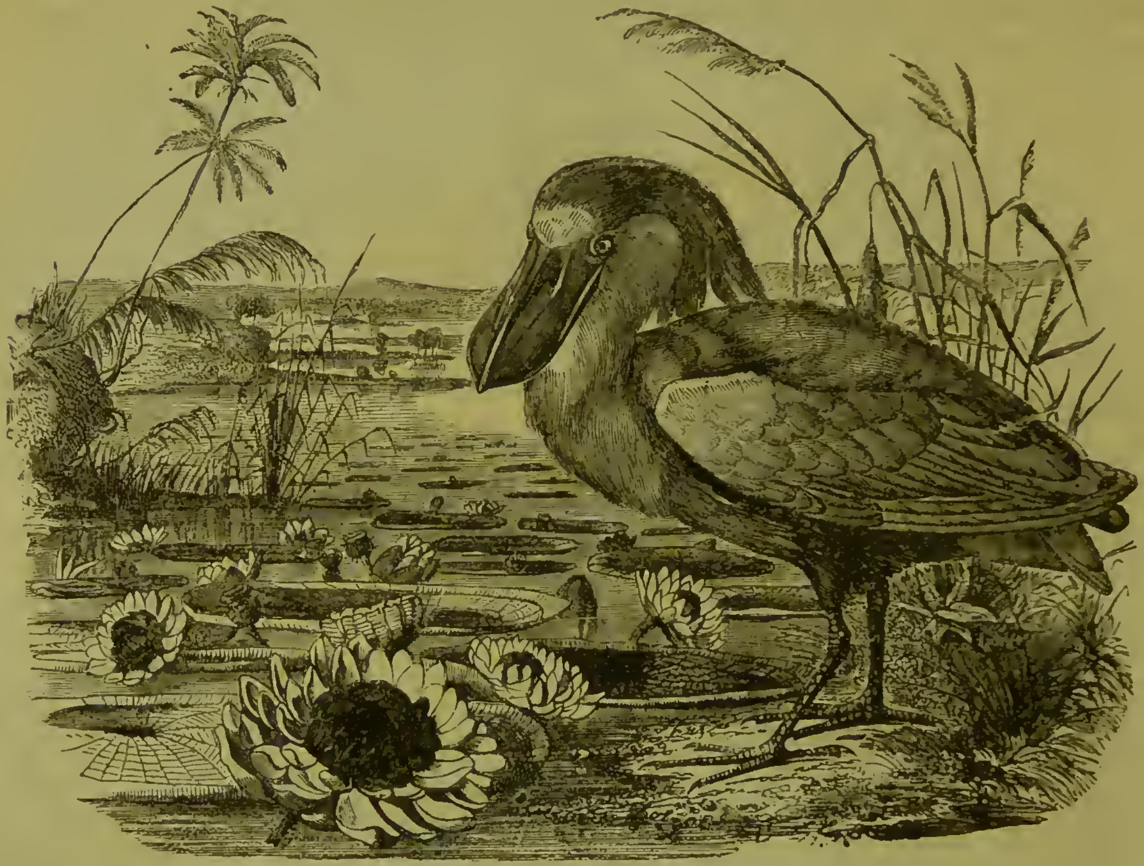
* Balæniceps rex.

THE BOAT-BILL.*

The Boat-bill is about the size of a domestic hen. Its beak resembles a boat reversed, having a strong ridge or keel down the middle of the upper mandible, and the sides spread out and bowed.



THE BOAT-BILL.

In the male, the upper part of the neck and breast are dirty white; the back and lower part of the belly rusty-reddish. The legs and feet are brown. From the head depends a long crest of feathers, falling backwards.

This species inhabits Cayenne, Guiana, and Brazil, and chiefly frequents such parts as are near the water. In such places it perches on the trees which hang over the streams; and, like the kingfisher, drops down on the fish that swim beneath. It has been thought to live on crabs likewise; but fish is its most common, if not its only food.

The true Plovers are divided into several genera, but they are closely united together by a similarity of habits. Of these, one genus† is the most typical. It is characterised by the beak being slender, straight, compressed, and shorter than the head; the nostrils being longitudinal slits in a membrane at the base. The wings are moderate, and pointed.

Some species of this genus are inhabitants of open districts and wild wastes, both dry and marshy, whence they retire to the coast during the severity of winter. Others are constantly resident on low, extensive sand-banks, or beds of shingle about the mouths of rivers, or along a flat line of sea-shore. They associate in flocks, except during the immediate season of incubation; and, after this period, the old birds assemble again for the purpose of migration, in which they precede the young: these, in similar bands, take their departure soon after.

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* Cancroma cancrophaga.—Linnæus.

† Charadrius.

THE GOLDEN PLOVER.*

This bird, spread over the whole of Europe, is by no means uncommon in our islands, frequenting heaths and swampy moors, but especially the barren, hilly districts of Scotland, and the adjacent counties, where it breeds. Thomson speaks of the Spring, while yet "the trembling year is unconfirmed," so that "scarce the bittern knows his time" to shake the marsh,

THE GOLDEN PLOVER.

> "———— Or from the shore,
> The plovers when to scatter o'er the heath,
> And sing their wild notes to the listening waste."

But towards the end of August, the duties of rearing their young being over, the Golden Plovers congregate in large flocks, which visit the fallows and newly-sown wheat-fields, where they sojourn till the severity of winter drives them to the shore. The flesh of these birds is considered but little inferior to that of the woodcock.

THE STILT PLOVER.†

To adopt a part of the interesting description of Gilbert White: "It must be matter of great curiosity to see the Stilt Plover move; to see how it can wield such a length of lever with such feeble muscles as the thighs seem to be furnished with. At least, one should expect it to be but a bad walker; but what adds to the wonder is, that it has no back toe. Now, without that steady prop to support its steps, it must be liable, in speculation, to perpetual vacillations, and seldom able to preserve the true centre of gravity. The old name of *Himantopus* is taken from Pliny, and, by an awkward metaphor, implies that the legs are as slender and pliant as if cut out of a thong of leather."

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* Charadrius pluvialis.

† Charadrius himantopus: Pennant.

THE STILT PLOVER.

Mr. Gould states that this genus, although widely distributed, contains only two well-authenticated species, one of which has furnished our illustration, and the other is known in North America.

THE AVOCET.*

The Avocet, so singular in its appearance, is not destitute of beauty; its beak, which has been compared to a thin piece of elastic whalebone, and its feet attracting particular attention. "This bird," says Mr. Yarrell, "is apparently more rare now than formerly. Sir Thomas Brown says they were not uncommon in his time in the marshy lands of Norfolk; and some years ago I was told that more than twenty specimens were received at Leadenhall Market for sale within one month: but now scarcely an example appears once in a year—the last I heard of was in the spring of 1837."

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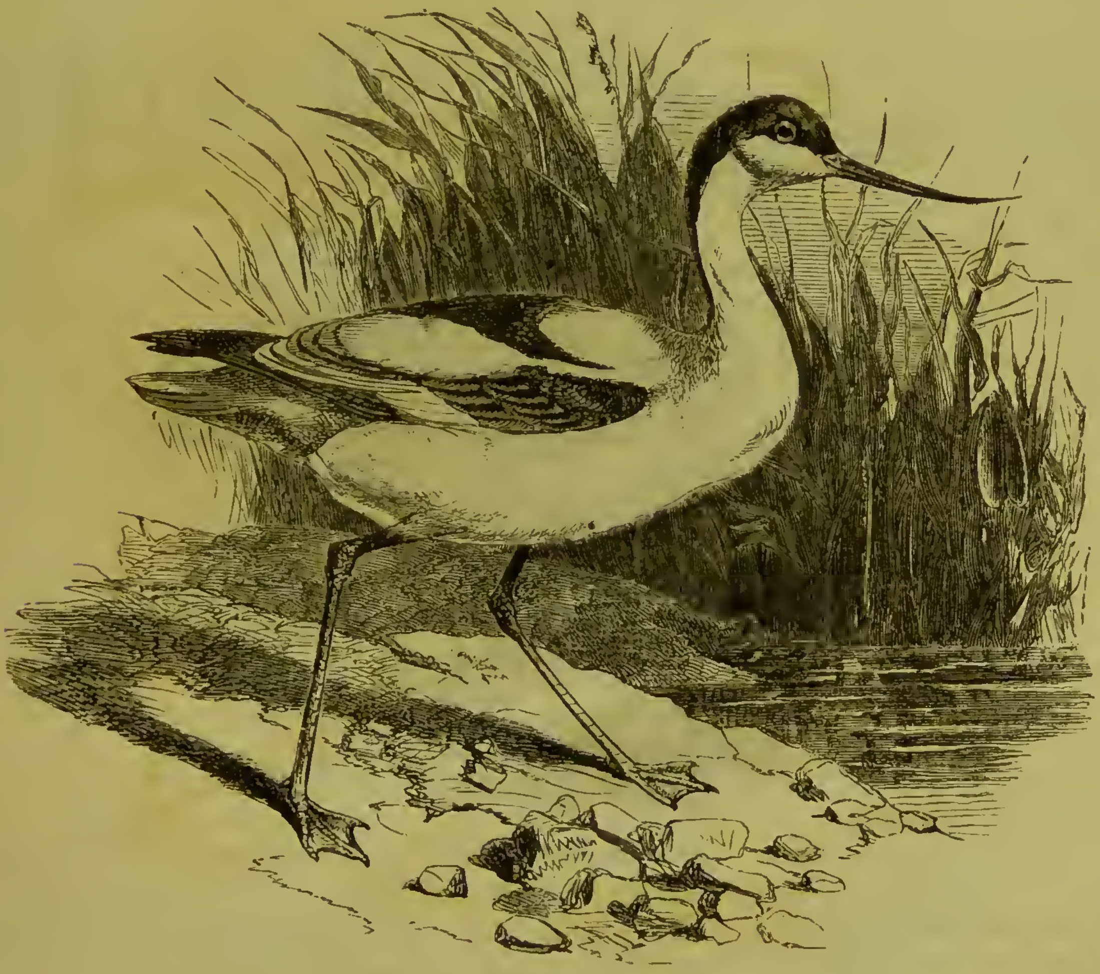
* Recurvirostra avosetta: Pennant.

As is the case with the other fen-birds, the avocet breeds in the herbage on the borders of the fen; but its feeding-grounds, and also its mode of feeding, are peculiar. The little runs or water-courses which cross the loose sand or sludge, and which always contain a considerable quantity of spawn, larvæ, or other animal matters, according to the time of the year, are the places which it frequents. It can swim, as, indeed, all birds that have close plumage on the under part can do less or more; but it perhaps does not swim voluntarily in any instance, and it never swims when it is feeding. It is not adapted for that, as the action of both the body and the bill require a fulcrum of something more stable than water. Swimming in still water, the bird could not scoop, as the stroke of the bill would merely drive the body backwards; and, as it feeds against the stream, its moving would be like that of a man attempting to force a boat against the stream by placing his pole upwards, and, by that means, adding his own exertion to the downward force of the current.



THE AVOCET.

The avocet wades up the shallow stream, and, only that its strokes are equally effective right and left, its action is not unlike that of a mower. Its legs are long and placed far asunder, and it proceeds by long and slow strides. Suppose the foot on one side advanced and planted, and the one on the other side in the rear to the full extent of its stride: the axis of its body will in that position be obliquely across the run, with the head toward the side of the rear foot, and the tail to that of the advanced one, both feet being nearly in the line of the centre of the run; and, if we suppose the left foot to be the one in advance, the bill will be over the right side of the run. The bird then bends its neck a little to the left and downwards, and, immediately advancing the right foot, it swings the body upon the left as a pivot, the bill scooping a transverse curve, and impelled by the swing of the body. As soon as the right foot is planted, or, rather, contemporaneously with the planting of it, the bird elevates its bill, in order that whatever food has been scooped up by the bill may be conveyed to the mouth; and that part of the process is very soon over, as the curve of the bill is not a portion of a circle, but of what geometers call "the curve of quickest descent." The bill is immediately lowered, with the point toward the right; and the advance of the left foot, and the swing of the body upon the right one, make another sweep in the opposite direction. In this way the bird advances up the run, scooping alternately left and right, with ease, with effect, and even with a grace almost unparalleled in the action of birds. It is, indeed, one of the most beautiful instances of animal mechanics that can possibly be imagined, and the motions are so performed that they can all be seen.

THE WOODCOCK.

Worms, aquatic insects, and some crustaceous animals yield the food for which the avocet searches diligently on soft sand and mud, and sometimes wades in the waters. It is stated that the peculiar marks in the sand arising from the singular form of the beak while the bird is in pursuit of its prey may be observed. The character of the beak, and the stooping action of the bird, have led to the provincial names it has received, of the "Scooper," and the "Cobbler's-awl Duck."

The general forms of a large and varied family* may be thus described: the bill long, straight, compressed, and soft, with the point enlarged; the two mandibles furrowed for half their length; the point of the upper mandible longer than the lower, the enlarged end sometimes forming a blunt hook. The nostrils are lateral, basal, slit longitudinally near the borders of the mandible, and covered by a membrane. The feet moderate, slender, the naked space above the knee very small; three toes before entirely divided, the external and middle toe united, and a hind toe. The wings moderate, the first quill rather shorter than, or of the same length as, the second, which is the longest.

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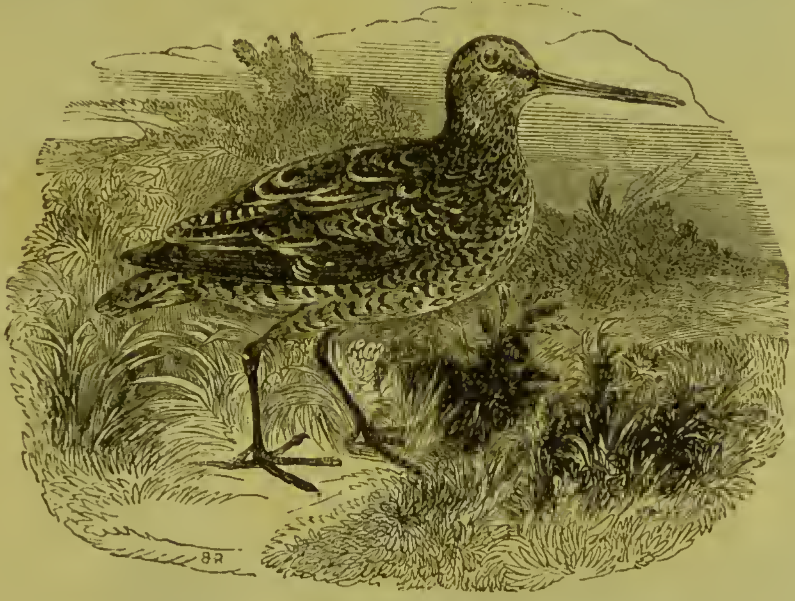
* Scolopacidæ.

"Most of this family," as Selby observes, "procure food by thrusting the bill into the soft earth, or the mud of shores, and thence extracting their prey; and, to facilitate this, an extraordinary development of nerve is distributed over and to the extreme point of the bill, thus endowing them with an exquisite sense of feeling; and in many species this member is further provided with a peculiar muscle, which, by the closing of the upper part of the mandibles, operates so as to expand them at the point, and enables the bird, with the bill still buried in the ground, to seize its prey the moment it is aware of being in contact with it." This peculiar mode of searching for their prey has obtained for many species—at least, the snipe, woodcocks, &c.—the title of *Birds of Suction.*

THE WOODCOCK.*

THE Woodcock is a native of the northern provinces of Continental Europe, but instances are known of its remaining in England to breed, thus passing the summer with us. It is, however, strictly speaking, a winter visitor to our shores. "The first autumnal flight of the woodcock," says Selby, "on its retreat from the northern countries of Europe, where it breeds and passes the summer, generally takes place towards the end of September, or the beginning of October; but as this consists of birds whose flight is directed to more southern latitudes than our islands, a few stragglers only remain; and the flight, after resting for a day or two, proceeds on its course to Portugal, and so onwards to the furthest limit of its equatorial movement. The direction taken by such a great and successive column of these birds, under migration from the north to the southern parts of Europe and Northern Africa, being in a great measure intersected by the south-western coasts of England and Ireland, accounts for the abundance of them in Devonshire and Cornwall, and the countries thus situated, and the still greater numbers found in the southern and western districts of Ireland, compared with the other parts of the kingdom."



THE GREAT SNIPE.

"It is thus, also, that woodcocks are generally first observed in these positions, and sometimes long before they are seen in England and Scotland. The succeeding flights, which continue at intervals during October and the two following months, becoming each more limited in extent, the whole country gradually receives its accession of winter visitants, those that take up their haunt in the northern counties of England and Scotland seldom arriving before the middle of November, or the beginning of December; the earlier flights, when they do alight in the country, merely remaining for a day, and then passing on to the southward. From this latter circumstance, the search for woodcocks in Northumberland, in the beginning of the season, is very uncertain, and to insure success, attention must be paid to the state of the weather, and the direction of the wind."

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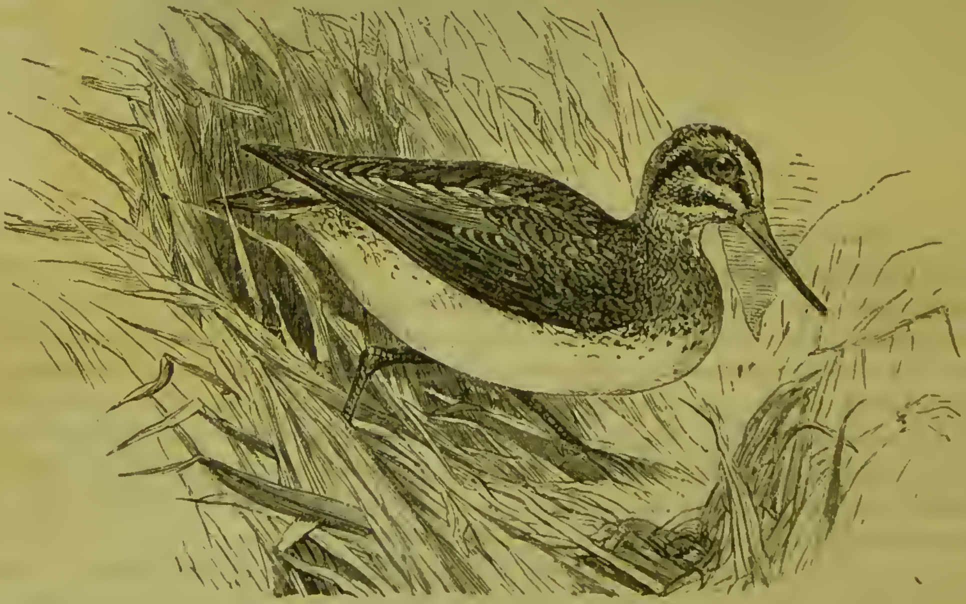
* Scolopax rusticola.

These birds land on our shores in the night, or in dark misty weather, for they are never seen to arrive, but are frequently discovered next morning in any ditch which affords them shelter after the extraordinary fatigue occasioned by the adverse gales which they often encounter in their aërial voyage. They do not remain near the shores longer than a day, when they are sufficiently recruited to proceed inland, and they visit the same haunts which they left in the preceding season. In temperate weather they retire to mossy moors, and high, bleak, mountainous parts; but as soon as the frost sets in and the snows begin to fall, they seek lower and warmer situations, with boggy grounds and springs, and little oozing mossy rills which are rarely frozen, where they shelter in close bushes of holly and furze, and the brakes of woody glens, or in dells which are covered with underwood. Here they remain concealed during the day, and remove to different haunts, feeding only in the night.

YOUNG SNIPE.

THE COMMON SNIPE.*

This bird, though a winter visitant, remains in numbers constantly in Britain, merely changing its abode according to the state of the weather, or the scarcity and abundance of food in different localities. The nest is found in a tuft of rushes or heath, in the midst of the moorland or marsh.



THE COMMON SNIPE.

A small species, being only about one-half the size of the Common Snipe, is one of our regular winter visitants. The scapulars, rump, and other parts of the back are glossed with rich metallic reflections of purple, bronze colour, and green. This is called the Jack Snipe. Another species is named the Great Snipe.*

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* Scolopax gallinago.

JACK SNIPE.

Mr. Selby says: "In addition to our native snipes, great flights come annually from Norway and other northern parts of Europe; and in Northumberland they arrive in the greatest numbers in the beginning of November. They seldom remain long in one situation, moving from place to place, under the regulation of various causes; so that the sportsman who has enjoyed excellent snipe-shooting one day may find the same spots entirely deserted on the following. Towards the end of March or the beginning of April, snipes, having nearly perfected their summer or nuptial plumage, select appropriate places for nidification, and the male bird commences his calls of invitation for a mate. These are always uttered upon the wing, and consist of a piping or clicking note, often repeated, and accompanied at intervals by a humming or bleating noise not unlike that of a goat,† apparently produced by a peculiar action of the wings, as the bird, whenever the sound is emitted, is observed to descend with great velocity, and with a trembling motion of the pinions. At this season it soars to an immense height, remaining long upon the wing; and its notes may frequently be heard when the bird itself is far beyond the reach of sight. These flights are performed at intervals during the day, but more commonly towards the evening, and are continued during the whole time that the female is engaged in incubation." The Redshank is nearly allied to the snipes.

THE REDSHANK.

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* Scolopax major.

† In France, one of the names by which the Common Snipe is known is that of *"Chèvre volant."*

THE DOTTEREL.*

Mr. Selby notices this bird as particularly abundant in Northern Asia and the eastern parts of Europe, and as inhabiting Siberia and the vast steppes of Tartary. It is also found, during its winter migration, in Italy and Spain; but the great body of these birds retires to the high latitudes of Northern Asia, Russia, and Lapland Alps to breed.

THE DOTTEREL.

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* Charadrius morinellus: Pennant.

Drayton sings of this bird :—

> "The Dotterell, which we think a very dainty dish,
> Whose taking makes such sport as man no more can wish ;
> For as you creepe, or curve, or lye, or stoupe, or goe,
> So marking you (with care) the apish bird doth doe,
> And acting everything, doth never mark the net,
> Till he be in the snare, which man for him has set."

Nor is this a solitary representation of the dotterel, which accords rather with poetry than fact. "It has always been considered," says Mr. Selby, "a stupid bird, but for what reason I cannot conceive. I allow that, on its first arrival, it shows but little fear of man ; but this, I apprehend, arises more from inexperience of persecution in its native wilds, than from any other cause, and which appears evident from the birds, when harassed and repeatedly fired at, soon becoming too cautious to admit of near approach any longer. Their habits also contribute to render them unwary, for being nocturnal feeders (like many others of the *Charadriadæ*), they are at rest and asleep during the greater part of the day, in which state also the golden plover (a wary bird when roused) will frequently admit of a close approach. As to the story of the dotterel mimicking the actions of the fowler, by stretching out its leg, wing, or head, when he sets the example, it, without doubt, arose from the motions that they, as well as other birds, usually and most naturally make when roused from a state of repose ; and which every one who attends to the habits of the feathered race must (in flocks of gulls, plovers, tringas, &c.) have frequently observed." The food consists principally of insects, slugs, and worms.

This bird is very extensively distributed, but its eggs are rarely obtained ; so that Mr. Gould says —"We only know one collector who possesses them." We find "dotrels" charged at one penny each—a considerable sum in those days—in the "Northumberland Household Book," and enumerated as admitted to "the high (his lordship's) table." They now find a ready sale in the London market at about six shillings a couple.

THE PIED OYSTER-CATCHER.

THE PIED OYSTER-CATCHER.*

The Oyster-catchers sit quietly in pairs the chief part of the day, on the banks or islands of shingle about the river or on the shore, but resort in the evening to the sands in large flocks. Mr. St. John, who has carefully observed them in the Highlands, remarks :—"I have often been puzzled to understand why, during the whole of the breeding season, the oyster-catchers remain in large flocks along the coast, notwithstanding their duties of hatching and rearing their young. When all the other birds are paired off, they still every now and then collect in the same numbers that they do in winter.

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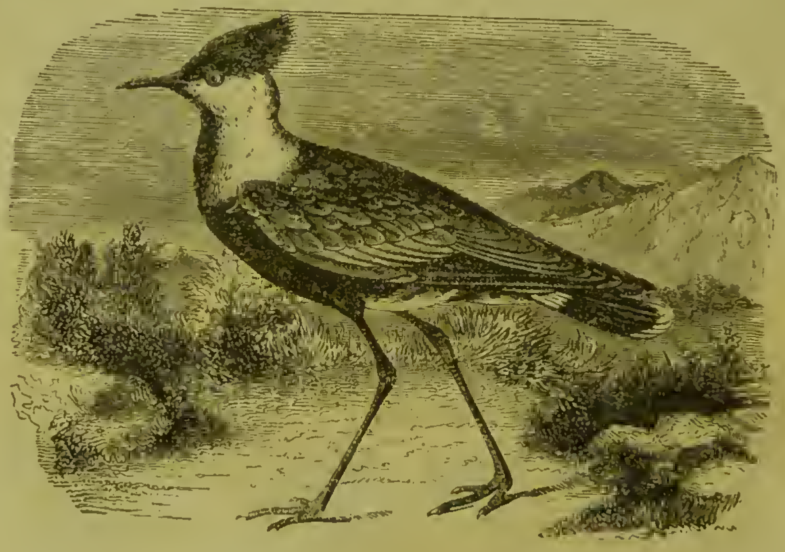
* Hæmatopus ostralegus : Linnæus.

"They lay very large eggs, of a greenish-brown colour, mottled with black. Both these birds and pewits soon become tame and familiar if kept in a garden or elsewhere, watching boldly for the worms turned up by the gardener when digging. The oyster-catcher's natural food appears to be shell-fish only; I see them digging up the cockles with their powerful bill, or detaching the small mussels from the scarps, and swallowing them whole, when not too large; if, however, one of these birds finds a cockle too large to swallow at once, he digs away at it with the hard point of his bill till he opens it, and then eats the fish, leaving the shell.

"It is a curious fact with regard to this bird, that if it drops winged in the sea, it not only swims with great ease, but dives, remaining under the water for so long a time, and rising again at such a distance, that I have known one escape out to sea in spite of my retriever, and I have watched the bird swim gallantly and with apparent ease across the bay, or to some bank at a considerable distance off. The feet of the oyster-catcher seem particularly ill-adapted for swimming, as the toes are very short and stiff in proportion to the size of the bird. Most of the waders, when shot above the water and winged, will swim for a short distance, but generally with difficulty; none of them, however, excepting this bird, attempt to dive.

"When in captivity the oyster-catcher eats almost anything that is offered to it. From its brilliant black-and-white plumage and red bill, as well as from its utility in destroying slugs and snails in the garden, where it searches for them with unceasing activity, it is both ornamental and useful, and worthy of being oftener kept for this purpose where a garden is surrounded by walls; it will, if taken young, remain with great contentment with poultry without being confined. I have found its nest in different localities, sometimes on the stones and sometimes on the sand close to high-water mark, and very often on the small islands and points of land about the river."



THE RUFF.

THE RUFF.*

In consequence of the ornamental plumes on the neck during the breeding season, the male is called the Ruff; while the female, to whose attire no such addition is made, is termed the Reeve.

Montague says: "The long feathers on the neck and sides of the head, in the male, that constitute the ruff and auricles, are of short duration, for they are scarcely completed in the month of May, and begin to fall the latter end of June. The change of these singular parts is accompanied by a complete change of plumage; the stronger colours, such as purple, chestnut, and some others, vanish at the same time, so that in their winter dress they become more generally alike, from being less varied in their plumage; but we observed that those who had the ruff more or less white, retained that colour about the neck after the summer or autumnal moulting. We noticed that in confinement their annual changes never varied; every spring produced the same coloured ruff and other feathers, but the tubercles on the face never appeared. A young male that was taken destitute of the ruff in the breeding season, whose plumage was mostly cinereous, except about the head and neck, put on the ruff in confinement the next spring for the first time, which was large, and the feathers were a mixture of white and chestnut; the scapulars and breast also marked with chestnut; and in the succeeding autumnal moulting he re-assumed his former cinereous plumage."

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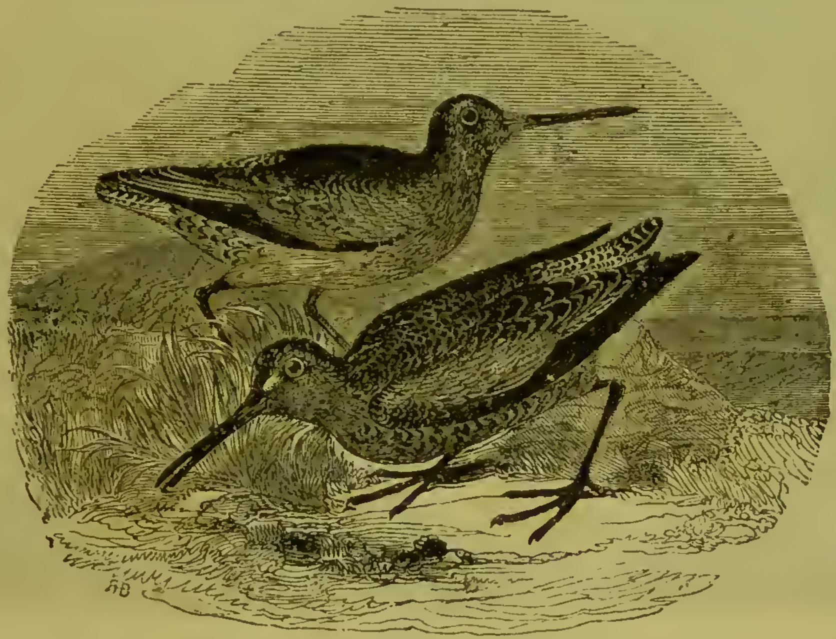
* Tringa vanellus.—Machetes pugnax: Cuvier.

The same writer observes, that "the trade of catching ruffs is confined to few persons, and scarcely repays their trouble and the expense of nets. These people live in obscure places on the verge of the fens, and are found out with difficulty; for few, if any birds are ever bought but by those who make a trade of fattening them for the table. Mr. Towns, the noted feeder at Spalding, assures us his family had been a hundred years in the trade; that they had supplied George II. and many noble families in the kingdom. He undertook, at the desire of the late Marquis of Townsend, when that nobleman was lord-lieutenant of Ireland, to take some ruffs to that country, and actually set off with twenty-seven dozen from Lincolnshire, left seven dozen at the Duke of Devonshire's, at Chatsworth continued his route across the kingdom to Holyhead, and delivered seventeen dozen alive in Dublin, having lost only three dozen in so long a journey, confined and greatly crowded as they were in baskets which were carried upon two horses. During our stay at Spalding, we were shown into a room where there were about seven dozen males and a dozen females, and of the former there were not two alike. Our intrusion to choose some birds drove them from their stands, and compelling some to trespass upon the premises of others, produced many battles. It is a remarkable character of these birds, that they feed most greedily the moment they are taken; a basin of bread and milk, or boiled wheat, placed before them, is instantly contended for, and so pugnacious is their disposition, that they would starve in the midst of plenty, if several dishes of food were not placed amongst them, at a distance from each other. Their actions in fighting are very similar to those of a game-cock; the head is lowered, and the beak held in a horizontal direction; the ruff, and indeed every feather, more or less distended, the former sweeping the ground as a shield to defend the more tender parts, the auricles erected, and the tail partly spread; upon the whole, assuming a most ferocious aspect. When either could obtain a firm hold with the bill, a leap succeeded, accompanied by a stroke of the wing, but they rarely injured each other.



THE KNOT.

"Few ruffs, comparatively speaking, are taken in the spring, as the old birds frequently pine, and will not readily fatten. The principal time is in September, when the young birds are on the wing; these are infinitely more delicate for the table, more readily submit to confinement, and are less inclined to fight. If this plan was generally enforced by the proprietors of fen-land, or made a bye-law amongst themselves, the breed would not be so reduced; but there are still fowlers who make two seasons, and by catching the old birds in the spring, especially the females, verify the fable of the goose and the golden eggs; the destruction of every female in the breeding season is the probable loss of four young." A kindred bird to the ruff is the Knot.*

THE COMMON SANDPIPER.†

A WRITER in the vicinity of Clitheroe, in Lancashire, says: "The Common Sandpiper breeds with us; and I, this year, started an old one from her nest, at the root of a fir-tree. She screamed out, and rolled about in such a manner, and seemed so completely disabled, that, although perfectly aware that her intention was to allure me from her nest, I could not resist my inclination to pursue her, and, in consequence, I had great difficulty in finding the nest again. It was built of a few dried leaves of the Weymouth pine, and contained three young ones just hatched, and an egg, through the shell of which the bill of the young chick was just making its way; yet, young as they were, on my taking out the egg to examine it, the little things, which could not have been out of their shells more than an hour or two, set off out of the nest with as much celerity as if they had been running about a fortnight. As I thought the old one would abandon the egg if the young ones left the nest, I caught them again, and covering them up with my hand for some time, they settled down again. Next day all four had disappeared."

SANDPIPERS.

THE SPOTTED SANDPIPER.‡

AUDUBON, in his "Ornithological Biography," thus refers to a power possessed by birds—that of being able to move their eggs when danger threatens:—"My esteemed friend, Thomas Macculloch of Picton, Nova Scotia, having transmitted to me a curious account of the attachment of one of these birds to her eggs, I here insert it with pleasure:—'Being on an excursion to the Hardwood Heights, which rise to the west of Picton, my attention was attracted by the warbling of a little bird, which appeared to be entirely new, and which proceeded from a small thicket a short way off. Whilst crossing an intervening meadow, I accidentally raised a Spotted Sandpiper from its nest, and having marked the spot, I hastened forwards; but the shyness of the object of my pursuit rendered all my efforts unavailing, and, returning to the nest I had just left, I expected to find it still unoccupied; but the sandpiper had resumed her place, and left it with great reluctance on my near approach. The nest contained four eggs, which I determined to remove on my return at night, and for the purpose of preventing the bird sitting again upon them, I placed a number of stones in a slanting position over the nest, and so close that it was impossible for the bird to get into it. On my return in the evening, however, I observed the little creature rise from beside the stones apparently in greater trepidation than ever, and more anxious to draw me away by the exhibition of all those little arts which they practise for this purpose. On examining the spot, I was very much surprised to find that the poor thing had not only hollowed out a new nest, but had actually succeeded in abstracting two eggs from the other nest. How the bird had contrived to move the eggs I cannot conceive, as the stones remained unaltered. This attachment to its nest and eggs appeared to me more singular, as the bird had but just commenced incubation, the eggs exhibiting very little appearance of the young.' "

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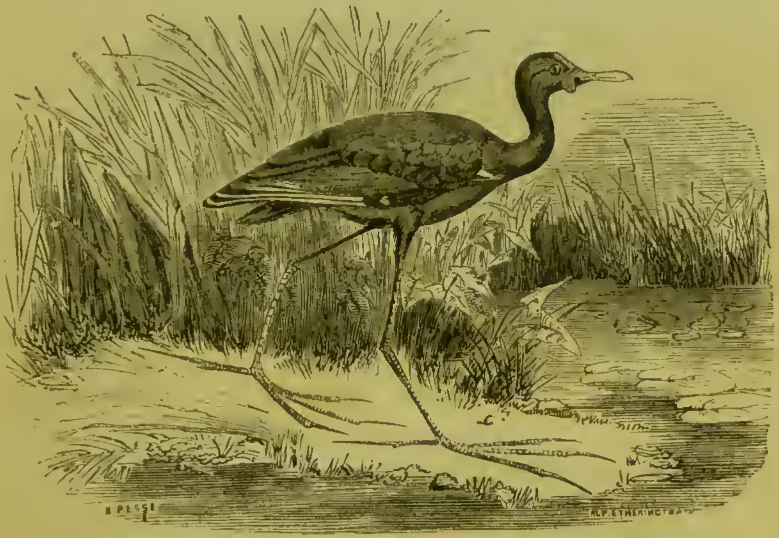
* Tringa grisea.

† Tringa hypoleucos: Pennant.

‡ Tringa macularia: Pennant.



THE COMMON GALLINULE.

THE COMMON GALLINULE.*

THIS bird, often called the Moor-hen or Water-hen, is dispersed over Europe generally, and is also found in many parts of Asia and Africa. It inhabits ponds, slow-moving and deep waters, canals, &c., where the borders are covered with luxuriant herbage, osier-beds, or reeds.

The following incident is given by Mr. Waterton:—"In 1826, I was helping a man to stub some large willows near the water's edge. There was a water-hen's nest at the root of one of them. It had seven eggs in it. I broke two of them, and saw that they contained embryo chicks. The labourer took up part of the nest, with the remaining five eggs in it, and placed it on the ground, and about three yards from the spot where we had found it. We continued in the same place for some hours afterwards, working at the willows. In the evening, when we went away, the old water-hen came back to the nest. Having no more occasion for the labourer in that place, I took the boat myself the next morning, and saw the water-hen sitting on the nest. On approaching the place I observed that she had collected a considerable quantity of grass and weeds, and that she had put them all around the nest. A week after this I went to watch her, and saw she had hatched; and, as I drew nearer to her, she went into the water, and the five little ones along with her."

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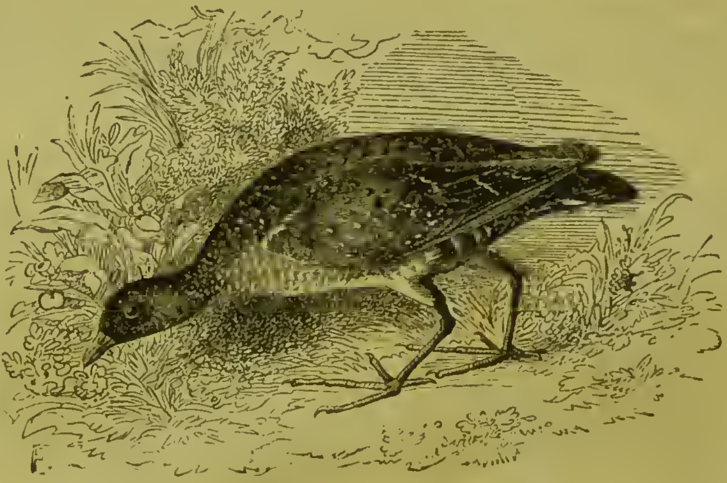
* Gallinula chloropus.

The nest of this bird, which is rather large, is rudely formed of reeds and rushes close to the water's edge, but generally concealed among the herbage. Frequently there are two, and sometimes three, broods in a year; but the birds are not so numerous as might be supposed, from the various casualties which diminish the young. Often are the eggs washed away by the summer floods; sometimes the heron, contrary to its usual habit, swims a little way out to capture the young bird; while pike and even trout will banquet on the progeny of the gallinule. Very soon after the young are hatched, they are able to proceed to water. The mother leads them forth in the morning and toward evening; but when the day is hot, and during the night, she returns with them to the nest, and covers them with her wings.



THE SPOTTED GALLINULE.

The flight of this bird is heavy and awkward, the legs hanging down; but it rises readily, and can keep up a long course on the wing. While walking, it flits up its short tail, so as to display the white under-coverts very conspicuously.

This bird is found also in many parts of Asia and Africa. It is about the size of a pigeon, and it weighs about a pound. The upper plumage is dark olive-green, inclining to black; the under plumage is deep bluish-gray, with white on the under tail-coverts and the edges of the wings, and there is also some dull white on the belly and thighs. The feathers on the flanks, which are loose and pendant, and hang over the upper parts of the thighs, are black, with streaks of white. The bill, which is about an inch in length, is thick and strong, arched in both mandibles towards the tip, and with the upper projecting a little; it is greenish at the tip, and reddish towards the base.

This bird swims gracefully, and dives not only to avoid danger, but often to obtain food, as it has been taken by lines baited for eels. It feeds habitually on insects, aquatic worms, the larvæ of dragon-flies, &c. When suddenly surprised on the bank, where it may often be seen at rest, it dashes into the water, where, half flying, half running over the surface, it makes its retreat. Its actions are smart and lively, and render it an interesting appendage to ornamental sheets of water.

THE SPOTTED GALLINULE.*

The Spotted Gallinule is extensively known. It is found in the southern parts of Russia; it is rare in the north of Germany and in Holland; it is more common in France and Provence; but it is most frequently met with in the southern and eastern parts of Europe.

The spotted gallinule is one of Britain's summer visitants, breeding in marshes overgrown with reeds and sedges. Its nest, formed of coarse aquatic plants, but having a lining of softer materials, is built on the wet ground, and often at the edge of the water. Here it deposits eight or ten eggs, of a pale reddish-white, spotted and speckled with dark reddish-brown. A naturalist says: "There can be no doubt that the spotted gallinule breeds in the marshes of Norfolk. We have seen a considerable number of its eggs in Yarmouth, which, as well as its young, were found in the neighbourhood of that place."

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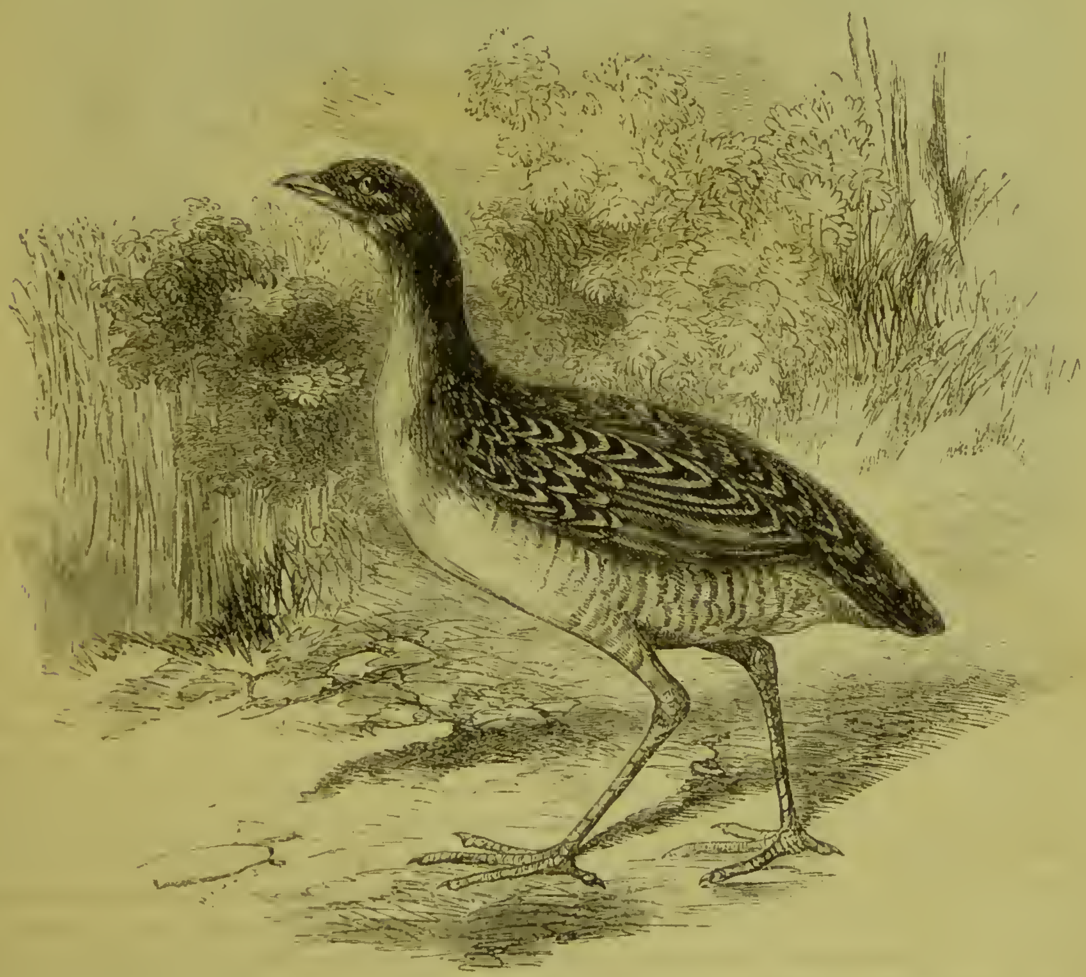
* Rallus porzana: Linnæus.

The flesh of a water-hen, in good season, when accustomed to a neighbouring wheat or barley stubble, is juicy and well-flavoured.

THE CORN-CRAKE OR LAND-RAIL.*

In the rich meadows of some parts of Britain, the peculiar cry of this bird may be heard resounding on every side, during the whole or greater part of May. Now the Land-rail seems close at hand, as if the bird were not a yard off; now it is far distant, while other voices in different parts of the meadow keep up the reiterated note, *crake, crake, crake*, from which the English and the Latin names are derived.



THE CORN-CRAKE OR LAND-RAIL.

Mr. Jesse, in his remarks on this bird, says: "I have met with an incident in the natural history of the corn-crake, which I believe is perfectly accurate, having been informed the bird will put on the semblance of death when exposed to danger from which it is unable to escape. The incident was this: a gentleman had a corn-crake brought to him by his dog, to all appearance quite dead. As it lay on the ground he turned it over with his foot, and was convinced it was dead. Standing by however, in silence, he suddenly saw it open an eye. He then took it up; its head fell, its legs hung loose, and it appeared quite dead. He then put it into his pocket, and before long he felt it all alive, and struggling to escape. He then took it out; it was as lifeless as before. Having laid it upon the ground, and retired to a distance, the bird in about five minutes warily raised its head, looked round, and decamped at full speed. I have seen a similar circumstance take place with a partridge, and it is well known that many insects will practise a similar deception."

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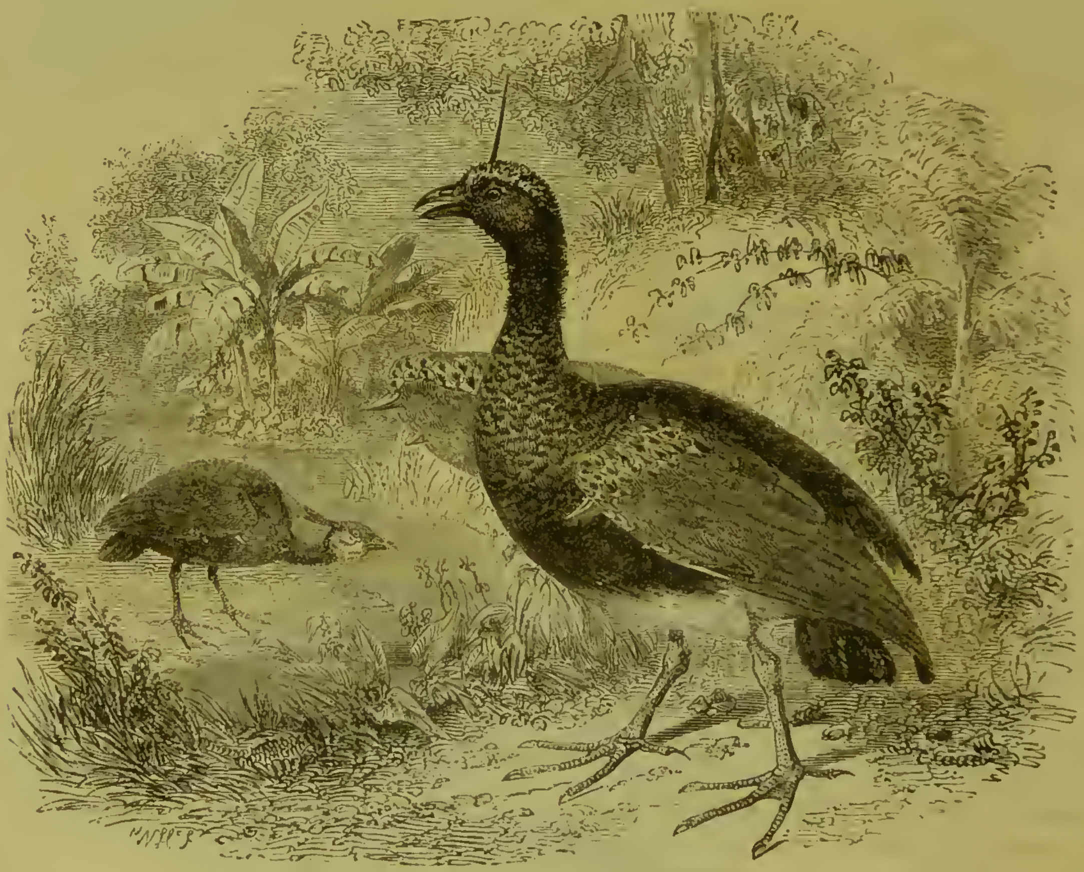
* Gallinula crex. Pennant.

THE HORNED SCREAMER.*

THE Linnæan genus of birds, called *Palamedea,* has been placed by Mr. Vigors among the *Grallatores.* The *Palamedea cornuta,* or horned screamer, is a South American bird, larger than a common goose, having a long spear-shaped horn projecting from the forehead. It lives in marshy or inundated places, which it makes to resound with its wild and loud cry.


THE HORNED SCREAMER.

It does not enter the great woods, perching only momentarily on dead branches. It sends forth shrill and piercing cries, which may be heard at a considerable distance; whence its English name. Bajon states that its food consists only of aquatic plants and seeds; though others, before him, have averred that it also feeds on reptiles. It never attacks other birds, and the only use it makes of its arms is, when the males dispute for the possession of the females. Once paired, however, the two quit each other no more; and when one dies, the other soon pines away with grief. The screamers construct their nests in the form of an oven at the foot of a tree, according to Pison; but Bajon tells us that they make it in bushes, at some distance from the ground, and often in reeds. The female in general lays but two eggs, of the size of those of a goose, and there is but one brood—in the month of January or February, except when the eggs are destroyed by any accident, and then a second takes place in April or May. As soon as the young are in a fit state to fly, they follow the mother, who gradually accustoms them to seek subsistence alone, after which they quit her. The flesh of the young, though black, is good eating; but that of the old is hard, and less agreeable to the taste.

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* Palamedea cornuta. Linnæus.

The Kamichi, or screamers, resemble the Jacanas in many respects, but are much larger. They resemble them in the two strong spurs on each wing; in the long toes and strong claws, especially that of the thumb, which is long and straight, as in the larks; but their bill, not much cleft, is but slightly compressed, not swelled, and the upper mandible is but slightly arched. Their legs are reticulated.

THE NOTORNIS.*

THIS is a specimen of one of the curious birds found only in Australia. The one represented by Mr. Gould, from whose splendid work our engraving was taken, was captured near the Isle of Resolution by the seal-fishers. Having noticed the marks made by the bird on the snow, they followed it to the place whither it withdrew, when it took flight, running rapidly before the dogs which followed it, and at last captured it. It uttered piercing cries and struggled for a long time. It was kept alive for four days; its body was roasted and eaten by the sailors, who found its flesh of an agreeable flavour.

THE NOTORNIS.

The *Notornis Mantelli* of Owen, named after the traveller Mantell, who was the first to observe it alive, approaches the Rails in the form of its beak and the general colour of its plumage, and is unlike them in the weakness of its wings; its primary feathers are very short. It cannot fly, but it runs with great speed. It probably has the power of swimming; the thickness of its plumage leads to the belief that he has a preference for damp spots. The head, neck, breast, and upper part of the belly and sides are of a beautiful purple-blue; the back, rump, and upper part of the tail are of a deep green olive, tipped with copper-green; a beautiful blue stripe separates the purple blue of the neck from the green of the back; the lower part of the belly and the thighs are of a dull bluish black; the wings are of a beautiful deep blue; the long feathers are tipped with green, forming a crescent where the wing is extended. The tail is deep green; its under-part white. The beak, talons, and iris are of brilliant red. The height is two feet.

Much has yet to be learned in reference to this bird. The ornithology of Australia, though far from being so peculiar and anomalous as its mammalogy, contains, nevertheless, many new and singular forms, of which the *Notornis* is an example. Its limited range is a formidable barrier to acquaintance with it, but much will doubtless be accomplished by the sagacity and intelligence of naturalists.

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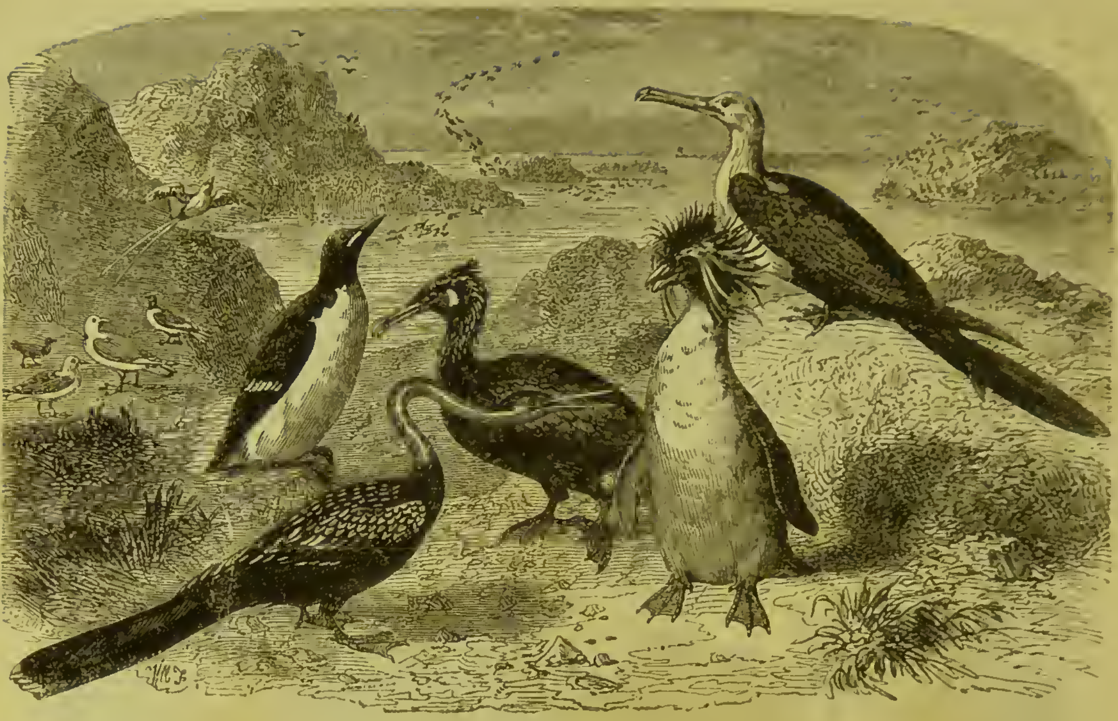
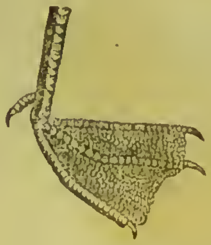
* Notornis Mantelli: Owen.

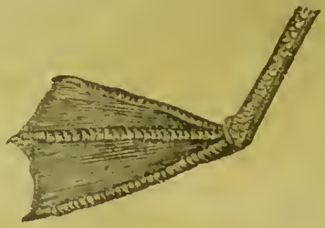


SWIMMING BIRDS.*

We now arrive at the last Order, containing the birds whose habits are decidedly aquatic, and whose structure has obtained for them the name of Water-Fowl. Their feet indicate their true character.



FOOT OF LESTRIS CATARRACTES.



FOOT OF PROCELLARIA URINATRIX.

THE MUTE SWAN.†

Pre-eminent for grace and elegance among the varied order of swimming birds are the Swans. The one known in our island, and the adjacent parts of the Continent, is alike conspicuous for the beauty of its form and the elegance of its attitudes. As we observe it gliding over its congenial element, we are disposed to exclaim with Wordsworth :—

> " Behold! the mantling spirit of reserve
> Fashions his neck into a goodly curve,
> An arch thrown back between luxuriant wings
> Of whitest garniture, like fir-tree boughs,
> To which, on some unruffled morning, clings
> A dusky weight of Winter's purest snows ! "

This noble bird is known only to us in a state more or less completely domesticated. The nest, consisting of a large mass of reeds, rushes, and other coarse herbage, is found on the ground near the edge of the water, and an island is generally chosen rather than a bank. The female produces six or seven eggs; these are of a dull greenish-white; they are four inches in length, and rather more than two inches in breadth.

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* Natatores.

† Cygnus olor.

The sign of one of our old city inns, "The Swan with Two Necks," arose out of a practice of those times. According to the swan laws, every one belonging to the king was marked with two *nicks* or notches; and the original sign was the royal bird so marked, that is to say, with two *nicks*. In process of time, by some mistake, the two nicks were called two necks; and the error has been perpetuated to our day.

THE BLACK-NECKED SWAN.*

A VERY beautiful species of the Swan is found in Chili, the Falkland Islands, the River Plate, and other parts of South America. It is distinguished by a black neck, which finely contrasts with the snowy whiteness of the rest of its plumage. The bill is red, and the legs flesh-colour. The engraving exhibits two of them bequeathed by the Earl of Derby, from his celebrated collection at Knowsley, to the Zoological Society of London, of which his lordship was the president. The society now possesses four examples of the black-necked swan. Another pair is in her Majesty's collection at Buckingham Palace.

THE BLACK-NECKED SWAN.

The comparison, "like to a black swan," arose from its being supposed there was no such bird; but the *Anas Plutonia* of Shaw has now become common in our menageries, where it breeds freely. It is black, with the exception of the primary and a few of the secondary quills, which are white. The bill is bright-red above, and sometimes has a slight tubercle at the base, which the female wants. The anterior part of the upper mandible is crossed by a whitish band.

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* Cygnus nigricollis.

THE DUCK.*

Wild Ducks are found in Asia and America, as well as Europe; in summer choosing the lakes and marshes of the north, and in autumn migrating to others which are in more temperate climes. In the marshy tracts of the British Isles, many remain throughout the year. The mallard is a handsome bird, but the female is very plain.

The domestic duck varies considerably in size, and in the colour of its plumage. The rearing of the large white Aylesbury breed, which is prevalent in Buckinghamshire, forms a part of the business of many cottagers.

"The Widowed Duck," from the easel of Sir Edwin Landseer, is very characteristic. The drake, with open beak and flaccid wings, lies dying on the ground; while his mate appears as if fully conscious of her loss. Little as it may be supposed, a duck can manifest very strong attachment. One, for instance, is mentioned, on good authority, who obeyed no voice but that of her owner, whom she followed everywhere, and for whom she would wait at the door when her mistress on a Sunday had entered the church, until a servant came to fetch her home.

THE WIDOWED DUCK.

Singular modes of capturing wild ducks are practised in America. In some ponds frequented by these birds, five or six wooden figures, cut and painted to represent ducks, and sunk by pieces of lead nailed to their bottoms, so as to float at the usual depth on the surface, are anchored in a favourable position for being raked from a concealment of brushwood, &c., on shore. The appearance of these decoys usually attracts passing flocks, which alight, and are soon shot down. Sometimes eight or ten of these painted ducks are fixed in a frame, in various swimming postures, and secured to the bow of the gunner's skiff, projecting before it in such a manner that the weight of the frame sinks the figures to their proper depth; the skiff is then dressed with sedge, or coarse grass, in an artful manner, as low as the water's edge; and under cover of this, which appears like a covey of ducks swimming by a small island, the gunner floats down, sometimes to the very skirts of a congregated multitude, and speedily pours in a destructive and repeated fire of shot among them. In winter, when detached pieces of ice are occasionally floating in the river, some of the fowlers on the Delaware paint their whole skiff, or canoe, white, and laying themselves flat at the bottom, with their hand over the side silently managing a small paddle, direct it imperceptibly into or near a flock, before the ducks have distinguished it from a floating mass of ice, and generally do great execution amongst them. A whole flock has sometimes been thus surprised asleep, with their heads under their wings. On land, another stratagem is sometimes practised with great success:—A large tight hogshead is sunk in the flat marsh or mud, near the place where ducks are accustomed to feed at low water, and where, otherwise, there is no shelter. The edges and top are artfully concealed with tufts of long coarse grass and reeds, or sedge. From within this the fowler, unseen and unsuspected, watches the collecting party, and, when a sufficient number offers, sweeps them down with great effect.

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* Anas boschas.

Among the methods resorted to in different countries for the capture of wild ducks, another is so remarkable as to require particular notice. On the river Ganges, in India, at Ceylon, and in China, a man wades into the water up to his chin, and, having his head covered with an empty calabash, approaches the place where the ducks are, and they, not regarding an object so commonly seen upon the water, suffer the man to mingle freely among the flock, when he has nothing to do but pull them under water by the legs, one by one, until he is satisfied, and then returns to the shore as unsuspected by the remainder as when he first came among them. For this purpose the earthen vessels used by the Gentoos, called kutcharee pots, which are thrown away as defiled after having been once used for cooking rice, are often employed instead of calabashes; and some authors state that hollow wooden vessels, with holes to see through, are sometimes used for the same purpose.

THE SUMMER DUCK.*

Almost all the coloured plumage of this bird shows a play of colours with metallic lustre. It has a pendent occipital crest of green and auricula purple, marked with two narrow white lines, one of them terminating behind the eye, the other extending over the eye to the bill. The female has a shorter crest, and the plumage is less vivid.

"In Pennsylvania," says Wilson, "the female usually begins to lay late in April, or early in May. Instances have been known where the nest was constructed of a few sticks laid in a fork of the branches; usually, however, the inside of a hollow tree is selected for this purpose. On the 18th of May, I visited a tree containing the nest of a summer duck, on the banks of Tuckahoe river, New Jersey. It was an old, grotesque, white oak, whose top had been torn off by a storm. It stood on the declivity of the bank, about twenty yards from the water. In this hollow and broken top, and about six feet down on the soft decayed wood, lay thirteen eggs, snugly covered with down, doubtless taken from the breast of the bird. These eggs were of an exact oval shape, less than those of a hen, the surface exceedingly fine grained and of the highest polish, and slightly yellowish, greatly resembling old polished ivory.

"This tree had been occupied probably by the same pair for four successive years in breeding-time; the person who gave me the information, and whose house was within twenty or thirty yards of the tree, said that he had seen the female, the spring preceding, carry down thirteen young, one by one, in less than ten minutes. She caught them in her bill by the wing or back of the neck, and landed them safely at the foot of the tree, whence she afterwards led them to the water. Under this same tree, at the time I visited it, a large sloop lay on the stocks, nearly finished; the deck was not more than twelve feet distant from the nest; yet, notwithstanding the presence and noise of the workmen, the ducks would not abandon their old breeding-place, but continued to pass out and in as if no person had been near. The male usually perched on an adjoining limb, and kept watch while the female was laying, and often also while she was sitting. A tame goose had chosen a hollow space at the root of the same tree to lay and hatch her young in. The summer duck seldom flies in flocks of more than three or four individuals together, but most commonly in pairs or singly." The food of this elegant bird consists of acorns, grain, the seeds of plants, and insects.

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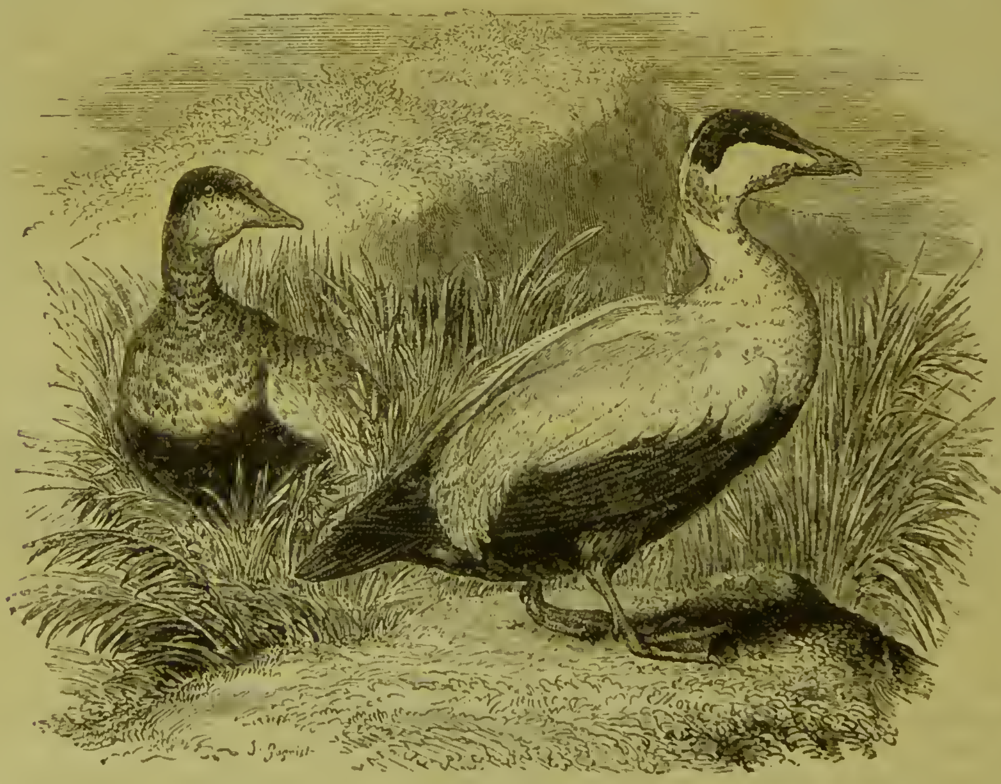
* Dendronessa sponsa.

THE SUMMER DUCK.



THE EIDER DUCK.

THE EIDER DUCK.*

The Eider Duck is a native of the Arctic Seas, and is found in great abundance along the shores of Iceland, Greenland, Lapland, Spitzbergen, and those of Hudson's and Baffin's Bays. It is chased by the Greenlanders for the sake of its flesh and its skin; the former, though rank, is valued as food; the latter yields clothing of singular warmth and comfort. "The down of this bird," says Shaw, "is of such value, that, when in purity, it is sold in Lapland for two rix-dollars a pound; it is extremely soft and warm, and so light and expansive that a couple of handfuls squeezed together are sufficient to fill a quilt five feet square." The males and females of the eider differ greatly in plumage.

THE CHINESE TEAL.†

The Mandarin Duck, or Chinese Teal, remarkable from the brilliancy of its plumage, never mates a second time. Of this Mr. Davis gives the following proof:—"From a pair of these birds, in Mr. Beale's aviary at Macao, the drake happened one night to be stolen. The duck was perfectly inconsolable, like Calypso after the departure of Ulysses. She retired into a corner, neglected her food and person, refused all society, and rejected with disdain the proffer of a second love. In a few days the purloined duck was recovered and brought back. The mutual demonstrations of joy were excessive; and what is more singular, the true husband, as if informed by his partner of what had happened in his absence, pounced upon the would-be lover, tore out his eyes, and injured him so much that he soon after died of his wounds."

THE CHINESE TEAL.

THE AMERICAN WIGEON.

Audubon says: "This duck is abundant during winter in New Orleans, where it is much esteemed on account of the juiciness of its flesh, and is best known by the name of *zinzin*. In the western country, and in most parts of the eastern and middle states, it is called the *bald pate.* While advancing along the shores of the Bay of Mexico, in April, 1837, I and my party observed this species in considerable numbers; and during the whole of our stay in the Texas, we daily saw, and very frequently procured wigeons. There they were found in ponds of brackish water, as well as in the fresh-water streams. Before we left that country they were all paired; and I was informed by the Honourable M. Fisher, secretary to the Texian navy, that a good number of them breed in the maritime districts along with several other ducks, and that he annually received many of the young birds. Their manners at this time fully proved the correctness of the statements of all those who spoke to me on this subject. Indeed, my opinion is, that some of these birds also propagate in certain portions of the most southern districts of the Floridas, and in the island of Cuba, as I have seen wigeons in the peninsula in single pair in the beginning of May."

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* Somateria Mollimissa.

† Anas galericulata.

Wilson says: "This species is very common in winter along the whole coast, from Florida to Rhode Island, but most abundant in Carolina, where it frequents the rice plantations. In Martinico great flocks take short flights from one rice-field to another, during the rainy season, and are much complained of by the planters. The wigeon is the constant attendant of the celebrated canvas-back duck, so abundant in various parts of the Chesapeake Bay. They are said to be in great plenty at St. Domingo and Cayenne, where they are called 'vingeon,' or 'gingeon;' are said sometimes to perch on trees, feed in company, and have a sentinel on the watch, like some other birds. They feed little during the day, but in the evenings come out from their hiding-places, and are then easily traced by their particular whistle, or *whew, whew.* This soft note or whistle is frequently imitated with success, to entice them within gun-shot. They are not known to breed in any part of the United States; are common in the winter months along the bays of Egg Harbour and Cape May, and also those of the Delaware. They leave these places in April, and appear upon the coasts of Hudson's Bay in May, as soon as the thaws come on, chiefly in pairs; lay there only from six to eight eggs, and feed on flies and worms in the swamps; depart in flocks in autumn. These birds are frequently brought to the market of Baltimore, and generally bring a good price, their flesh being excellent. They are of a lively, frolicsome disposition, and with proper attention might easily be domesticated."

THE COMMON SHELLDRAKE.*

COLONEL HAWKER, in reference to their habits, says: "The young shelldrakes, directly after being hatched in the rabbit-burrows, are taken by the parent birds to the sea, where they may be seen in what the boatmen call troops, of from thirty to forty; but as the female seldom hatches more than fourteen eggs, it is clear that each flock is formed by two or three broods. On their being approached the old ones fly away, and leave the young to shift for themselves by diving. They may be easily shot when they come up, but you can seldom kill more than one or two at a time, as they always disperse before you can get very near them.

"These birds show but tame sport with a gun, and are good for nothing when killed. But, in winter nights, they often give you a fine shot on the mud, though they are so white that you can seldom perceive them, even afloat, without a good moon. Be prepared to fire directly you rise; as they being quick-sighted birds, will give you but little time to present your gun. We had a great many burrow ducks on our coast, Hampshire and Dorsetshire, during the last hard winter. They were the wildest of birds till half-starved by the freezing of the shell-fish, and then they became the tamest of all wild fowl.

"You may keep young burrow ducks for five or six weeks, provided you give them crumbs of bread, and only a little water three times a day. But if you let them get into the water or even drink too much before they are full grown, and fit to be turned out on your pond, you are almost sure to kill them. This appears quite a paradox with birds that, in their wild state, are always in the water; but such is the case."

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* Anas tadornas.

THE TEAL.*

This is one of the smallest and also one of the most beautiful of British ducks. It is distributed over a great part of Europe, Northern Asia, and America. Multitudes every winter visit the fens of Britain, breeding, but not numerously, in the marshes of its northern counties. "Our indigenous broods," says Mr. Selby, "I am inclined to think, seldom quit the immediate neighbourhood of the place in which they were bred, as I have repeatedly observed them to haunt the same district from the time of their hatching till they separated and paired, on the approach of the following spring." The nest is formed of a large mass of decayed vegetables, with a lining of down and feathers, and contains eight or ten eggs. "Wild ducks and teal breed also," says Mr. Jesse, "amongst the heather in Woolmer Forest, and generally in the highest grounds. One of the woodmen, who has a cottage in the forest, informed me that he had found a teal's nest, with nine eggs in it, in a situation of this description."

Of the ducks, generally, we have now spoken; we turn, therefore, to their associates—the Geese, of whom a poet says:—

"Now o'er our heads compact they fly;
See, as we speak, careering high,
A flock of wild ducks cloud the air
In wedge-like shape triangular;
And gray-geese there, outstretched, combine
Their troop in one unbroken line.
Now in small bands dispersed, or each
His prey pursuing o'er the beach,
On their strong legs they wade; divide
Deep down the gulfy food, and glide
Afar unseen; or, rising, meet
The breasting wave with wary feet;
Their strokes alternately advance,
And cleave secure the deep expanse."

THE GRAY LAG, OR WILD GOOSE.†

According to Pennant, this was the only species that the Britons could take young and familiarise. The Gray Lag Goose and the Domestic Goose may, therefore, be considered identical. It is the *Anser* of the Romans—the same that saved the Capitol by its vigilance, and was cherished accordingly. Pliny states that these birds were driven from a distance on foot to Rome; he mentions the value of the feathers of the white ones, and relates that in some places they were plucked twice in a year.

Pennant thus writes: "This is our largest species; the heaviest weigh ten pounds; the length is two feet nine inches; the extent five feet. The bill is large and elevated, of a flesh-colour tinged with yellow; the head and neck cinereous, mixed with ochraceous yellow; the hind part of the neck very pale, and at the base of a yellowish brown; the breast and belly whitish, clouded with gray or ash colour; the back gray; the lesser coverts of the wings almost white, the middle row deep cinereous slightly edged with white; the coverts of the tail and the vent-feathers of a pure white; the middle feathers of the tail dusky, tipped with white, the exterior feathers almost white; the legs of a flesh-colour."

The wild goose greatly varies, like most domesticated animals, in its reclaimed state; but it is said always to retain the whiteness of the coverts of the tail and the vent-feathers; it is esteemed in proportion to the whiteness of the plumage.

"The gray lag," says Mr. Gould, "is known to inhabit all the extensive marshy districts throughout the temperate portions of Europe generally; its range northwards not extending further than the fifty-third degree of latitude, while southwards it extends to the northern portions of Africa, easterly to Persia, and we believe it is generally dispersed over Asia Minor."

This bird assembles in flocks, and seeks the most open and wild districts, often descending on fields of newly-sprung wheat, which with the blades of fine grasses, trefoil, and grain, constitute its food. Its nest is made on heathy spots, and in marshes, upon tussocks of rushes and dried herbs. There are five or six eggs, sometimes more, but rarely twelve or fourteen, of a dirty-greenish, or, as Gould remarks, of a sullied white.

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* Querquedula crecca.

† Anser ferus.

THE DOMESTIC GOOSE.

This is a bird of no little value. Not only does it figure with general acceptance on our tables, but its feathers still yield quills, while the smaller ones and the down contribute largely to the nightly repose of multitudes.

Of the attachment of geese to particular persons there are many instances. A farmer in Cheshire had a flock of these birds when, at the end of three years, one, without any apparent cause, showed a great partiality for its master. It followed him to the mill, the blacksmith's shop, or through the bustling streets of a neighbouring town; and so great was its perseverance that he was compelled to fasten it up when he wished to go out alone. Strange to tell, the farmer thought this attachment ominous of evil; and, in a moment of alarm, killed his faithful companion.

Rue aux Ours is the name of a street in Paris, formerly called *Rue aux Oies*, term for geese, and was given to it on account of the great number of *rotisseurs* that resided in it. Thus, the authors of the "Dictionnaire Historique de la Ville de Paris" say:—"The capons of Mans, the pullets of Mezerai, fattened by art, the chickens of Caux, and a thousand other luxuries, were absolutely unknown in those old times of moderation and continence, when good morals prevailed, and our fathers, less sensual and delicate than the present generation, regaled themselves upon geese, a kind of fowl despised in an age where sensuality and gluttony have the ascendancy."

In France the goose has long been in little repute as a dish, and seldom appears on the tables of the epicures of Paris. The flesh they condemn as coarse and unwholesome, and our ordinary accompaniment of apple sauce, when mentioned, never fails to elicit flashes of astonishment subsiding into peals of laughter. But the wings and thighs of geese made into pies, and properly truffled, are regarded as great delicacies. The department of Perigord, with Toulouse and Bayonne, used to cook annually about 120,000 of these pies. The *pâté de foie gras* is still in great requisition in France. But to obtain the delicacy great cruelty is practised. The wretched geese are nailed by the feet to a board, placed before a hot fire, crammed with food, and supplied with drink; and it is in this dreadful situation that, while fear wastes away the flesh, the liver becomes enormously swollen, and thus supplies the desideratum for those "who live to eat."

THE BEAN GOOSE.*

This is one of the wild geese, having a comparatively small and short bill. The wings, when closed, reach beyond the end of the tail. In bulk, it is generally rather less than the Gray Lag, and is sometimes called provincially the Small Gray Goose.

During an excursion made by a party of naturalists in Sutherlandshire, in the summer of 1834, Mr. Selby says:—"We were agreeably surprised to find that the Bean Goose annually breeds upon several of the Sutherland lakes. The first intimation we received of this interesting fact was at Lairg, where we were informed that a few pairs bred upon some islands about twelve miles up Loch Shin. We accordingly took boat the following morning, and, upon arriving at the place, discovered a single pair, attended by four or five young goslings. None were obtained, as the old birds, being wild, escaped, seemingly uninjured, although repeatedly fired at; and the goslings immediately dived, and escaped into the reeds and other herbage. Upon Loch Naver we also found several pairs attended by their young, seemingly about a fortnight or three weeks old, one of which, after a severe chase, we procured. Upon the islands of Loch Laighal, from thirty to forty pairs, we were informed, annually had their nests. We saw several old birds, and the nests that had been used, which are concealed in heath, upwards of three feet in height, that covers the islands. The eggs were all hatched, and most of the young had betaken themselves to the neighbouring moors, where they continue till able to fly, secreting themselves when disturbed in the highest heather. At Tongue we saw some goslings about a month old (following a hen), which had been hatched from eggs taken at Loch Laighal. We were told they became nearly as tame as common geese, but refuse to intermix or breed with them. The eggs, from five to seven in number, are smaller than those of the common goose, but of a similar shape and colour."

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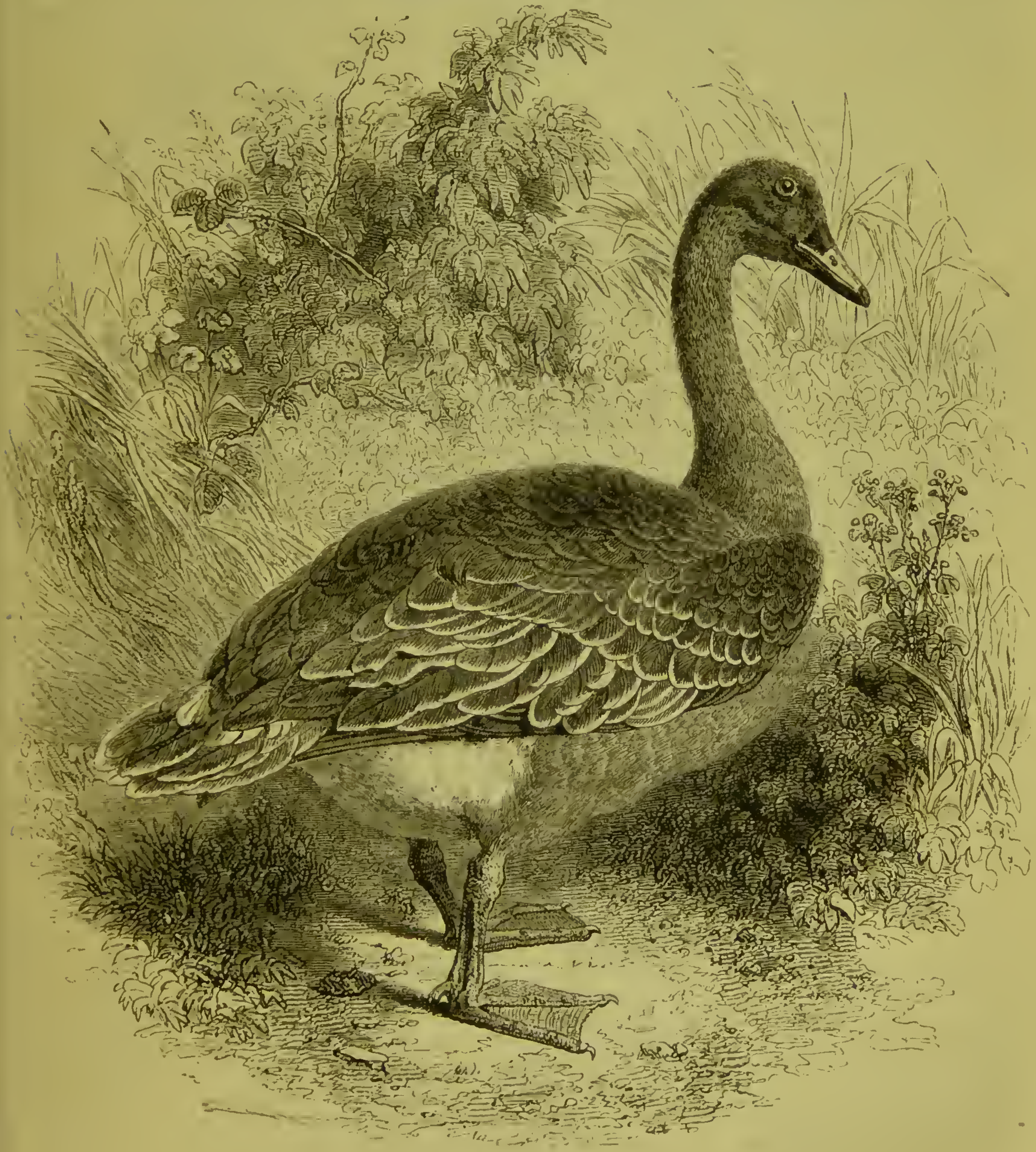
* Anser segetum.

THE EGYPTIAN GOOSE.*

ARISTOTLE mentions this bird as haunting the banks of lakes and rivers. It is also named in two of the comedies of Aristophanes. Athenaeus praises it on account of its eggs, giving them the second place, those of the peacock being assigned the first; and Ælian alludes to its cunning.



THE BEAN GOOSE.

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* Anser Ægypticus: Briss. Chenalopex Ægypticus: Gould.

Herodotus, however, directs special attention to the Egyptian Goose. He shows it was held sacred by the Egyptians, and modern travellers found evidence of its being, at least, a favourite dish among the priests. Mr. Salt remarks: "Horus Apollo says, the old geese stay with their young in the most imminent danger, at the risk of their own lives, which I have myself frequently witnessed. Vulpanser is the Goose of the Nile, and wherever this goose is represented on the walls of the temples in colours, the resemblance may be clearly traced." It is also stated that a place in Upper Egypt had its name, Chenoboseion, or Chenoboscia ("goosepens"), from these birds being fed there, probably for sale. These, however, may have been sacred geese, as the goose is said to have been a bird under the care of Isis.

The bill of the Egyptian Goose is as long as the head, slender, nearly straight, rounded at the tip, and laminated on the margin. The upper mandible is slightly curved, the nail hooked, and the lower mandible flat. The wings resemble those of the spur-winged goose, on the bend of the wing or wrist of which is placed a strong, white, horny spur, about five-eighths of an inch in length, turning upwards, and rather inwards.

The sexes are nearly similar; the female is rather smaller than the male, and its colouring is less intense. There is a narrow edging of feathers round the base of the bill, a line running nearly straight from that edging to the eye, and a larger patch surrounding the eye, of a chestnut hue. In the middle of the breast there is also a patch of dark chestnut; the rest of the under part of the body, from the slight collar to the thighs, is of a pale buff, with fine irregular transverse blackish brown lines. The legs and feet are of a reddish flesh-colour.

Mr. Gould states that he has placed the Egyptian Goose among the "Birds of Europe," not from the number of half-reclaimed individuals which are annually shot in Britain, but from the circumstance of its occasionally visiting the southern parts of the Continent, from its native country, Africa. M. Temminck points out the Island of Sicily as one of the places frequented by it, and adds that this is the species which would appear to have been held in great veneration by the ancient Egyptians, as we frequently find a figure of it among the monuments of that celebrated people. He states that it is abundant on the banks of the Nile, and is distributed over the whole of the vast continent of Africa. This handsome species breeds freely in confinement, and is often seen in the aviaries and near the lakes of those who take pleasure in collecting and domesticating ornamental water-birds.

"The breeding habits of this bird in a wild state are," says Mr. Yarrell, "I believe, but little known: they hatch and rear their young without difficulty in confinement, and have bred several seasons in succession in the Gardens of the Zoological Society.

"In the summer of 1838 an Egyptian goose, in those gardens, paired with a Penguin drake — so called from its walking nearly upright, but which is only a variety of the Common Domestic Duck—and the eggs were productive. The same two birds were kept together in the following season, and the result was, more productive eggs. The young birds were preserved, and kept by themselves, experimentally.

"Besides various instances of single specimens of the Egyptian goose having been obtained in this country, a flock of five were seen in the Fern Islands in April, 1830. A small flock visited the Tweed in February, 1839. Three were shot at Campsie, near Glasgow, in November, 1832. Mr. Wallace, of Douglas, sent me word that a flock of nine were seen in the Isle of Man, in September, 1838. This species has been killed in Ireland. Four were shot on the Severn, near Bridgewater, in February, 1840; two were shot in Dorsetshire, in 1836." Colonel Hawker mentions two killed in Norfolk, and three at Longparish, in Hampshire, in the winter of 1823; and the next year again during some tremendous gales from the west, a flock of about eighty appeared near the same place, when two more were killed.

THE CANADA GOOSE.*

The Canada Goose is the ordinary wild goose of the middle and boreal regions of North America. It is a migrating bird, breeding in the higher latitudes, within the Arctic circle; whence, on the approach of winter, vast flocks wing their way southwards, where every means for their destruction are in active operation.

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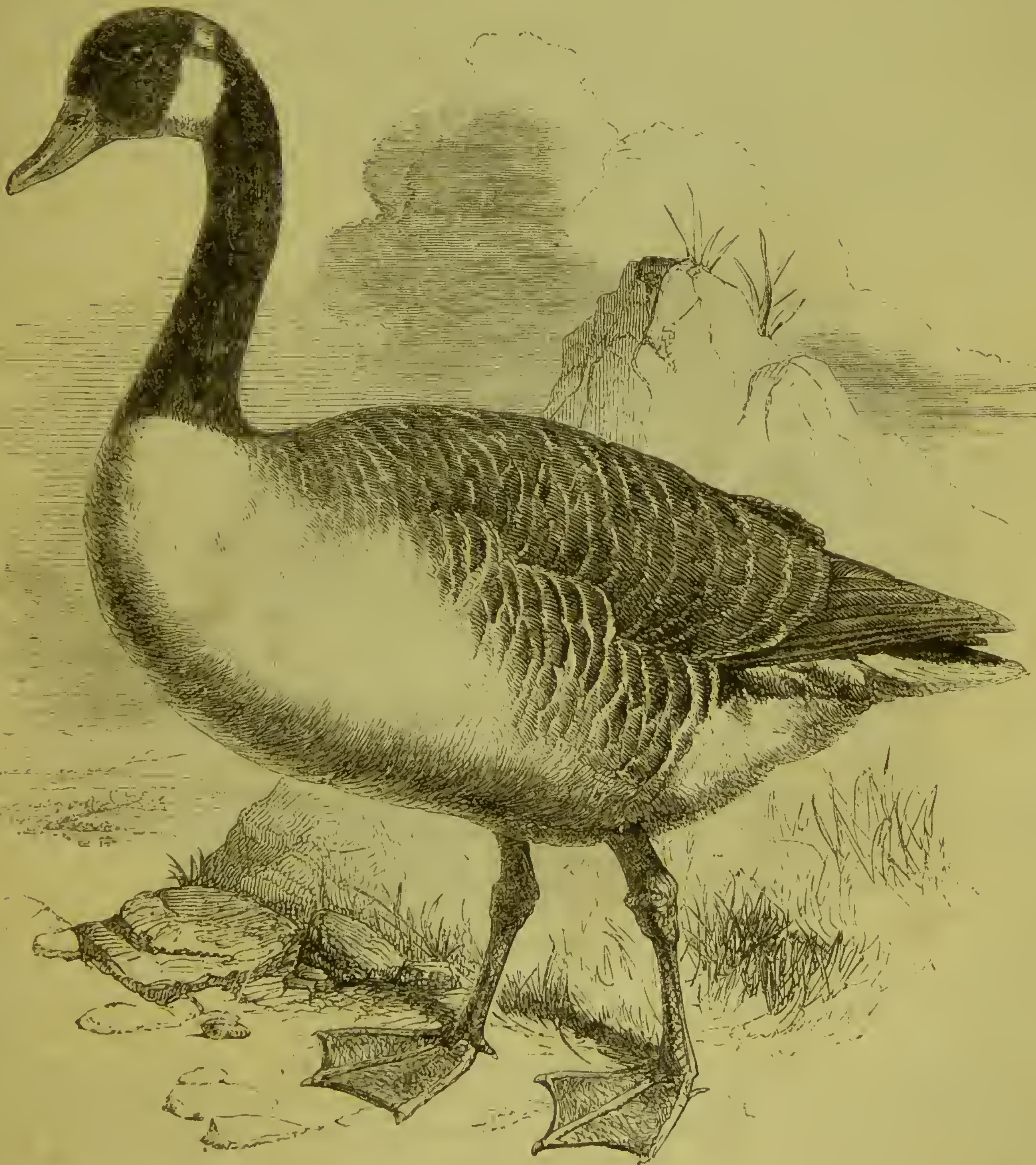
* Anser Canadensis: Willughby.

Though the ordinary European tame goose is kept in North America, the Canada goose is also kept as a domestic bird, and is said to thrive better than the former. In France and England it has been domiciled, and interbreeds with the common goose; the hybrids are highly esteemed for the very superior flavour and delicacy of their flesh. The Canada goose is said to be extremely watchful, and more sensible of approaching changes in the atmosphere than our ordinary species.



THE CANADA GOOSE.

A writer in the "Magazine of Natural History" says: "In this neighbourhood (near Derby), we are frequently visited by small flocks of the Canada goose, which is a bird, I believe, of very local distribution. They always announce their approach by a loud noise, and, after wheeling two or three times round the piece of water near the house, they alight and commence grazing. They are very ornamental objects, stalking about the lawn, tossing their heads and making curious contortions with their long necks. It frequently happens that two remain when all the rest are flown. After reconnoitering the place for a few days, they usually fix on the corner of an island as their nesting-place. This favourite nook of theirs is not far from where a pair of moorhens, year after year, produce their young; yet neither goose nor moorhen ever interfere with each other, but keep on very good terms; nevertheless, the former does not permit her sooty companion to make too close an approach. After the female goose has fully made up her mind as to the locality of her nursery, she begins plucking feathers, straws, and other soft materials, until she has at last constructed a feather bed. Having laid her eggs, generally six, she sits with most exemplary patience, and notwithstanding the proximity of the water, which offers a great temptation, it is rare to find her off her nest. During the period of incubation the male is, through the greater part of the day, sailing in measured time and slow over the water, never approaching his mate very near, nor straying very far. On the approach of any intruder, he displays great uneasiness, and his tranquillity does not return till the danger is over. Shortly after the goslings have extricated themselves from their brittle covering, they are conducted to the water by the female, when they are joined by the male, who brings up the rear. The little family remain together till the return of the flock, when all mix promiscuously, recruit themselves for a few days, and then depart. A pinioned female was joined by a male. When they were approached, the male did not fly away until he was pursued so closely as to be in danger of being caught; he remained with his mate as long as was consistent with his liberty; when that was in danger, and not till then, he deserted the female. Several of the wild goslings were obtained in the season of 1832; two of them passed into the hands of a neighbouring farmer, in whose possession they have remained ever since. They associate with his domesticated gray lag geese, and are very peaceable. Montagu had observed, that the Canada goose will breed with the common species. Bewick says, 'Great numbers of these Canadian geese were driven from their haunts during the severe snow storms of January and February, 1814; they were taken upon the sea-shore, near Hartlepool, and divided among the farmers in the neighbourhood, no pains having been taken to keep the breed pure.'"

THE BERNICLE GOOSE.

THE BERNICLE GOOSE.*

As a singular specimen of credulity and fallacious reasoning, we give an extract from the "Herbal" of Gerard, who lived in the reign of Queen Elizabeth: "There is," he says, "a small island in Lancashire, called the Pile of Foulders (on the west side of the entrance into Morecambe Bay, about fifteen miles south of Ulverston), wherein are found the broken pieces of old and bruised ships, and also the trunks and bodies, with the branches of old and rotten trees cast up their likeness; whereon is found a certain spume or froth, that, in time, hardeneth unto certain shells, in shape like those of the muskle but sharper pointed, and of a whitish colour, wherein is contained a thing in form like a lace of silke finely wove as it were together; one end whereof is fastened unto the inside of the shell, even as the fish of oisters and muskles are; the other end is made fast unto the belly of a rude mass or lump, which in time cometh to the shape and form of a bird; when it is perfectly formed, the shell gapeth open, and the first thing that appeareth is the aforesaid lace or string; next come the legs of the bird hanging out, and, as it groweth greater, it openeth the shell by degrees, till at length it is all come forth, and hangeth only by the bill; in short space after, it cometh to full maturitie, and falleth into the sea, where it gathereth feathers, and groweth to a fowl bigger than a mallard, and lesser than a goose, which the people in Lancashire call by no other name than a tree-goose; which place aforesaid and all those parts adjoining, do so much abound therewith, that one of the best is bought for three pence."

THE NEW HOLLAND CEREOPSIS.

The popular error that the molluscous animal called the bernicle contained the young of a species of goose, called in consequence the Bernicle Goose, lasted for many ages, and still prevails among the uneducated on the shores of all the European seas. One reason of the continuance of this error in several Roman Catholic countries, is the permission granted by the priest to eat this goose on fish-days, because it was considered to partake more of the character of a fish than of a fowl.

It may seem strange to the reader, yet the following notice, sent by Sir Robert Moray to the Royal Society, actually appears in their printed Transactions. He says: "The pedicle seems to draw and convey the matter which serves for the growth and vegetation of the shell, and the little bird within it. In every shell that I opened I found a perfect *sea-fowl*, the little bill like that of a *goose*, the eyes marked; the head, breast, wings, tail, and feet formed; the feathers everywhere perfectly shaped, and blackish coloured; and the *feet* like those of other water-fowl to my best remembrance. Nor did I ever see any of the little birds alive, nor met with anybody who did; only some credible persons have assured me that they have seen some as big as their fist."

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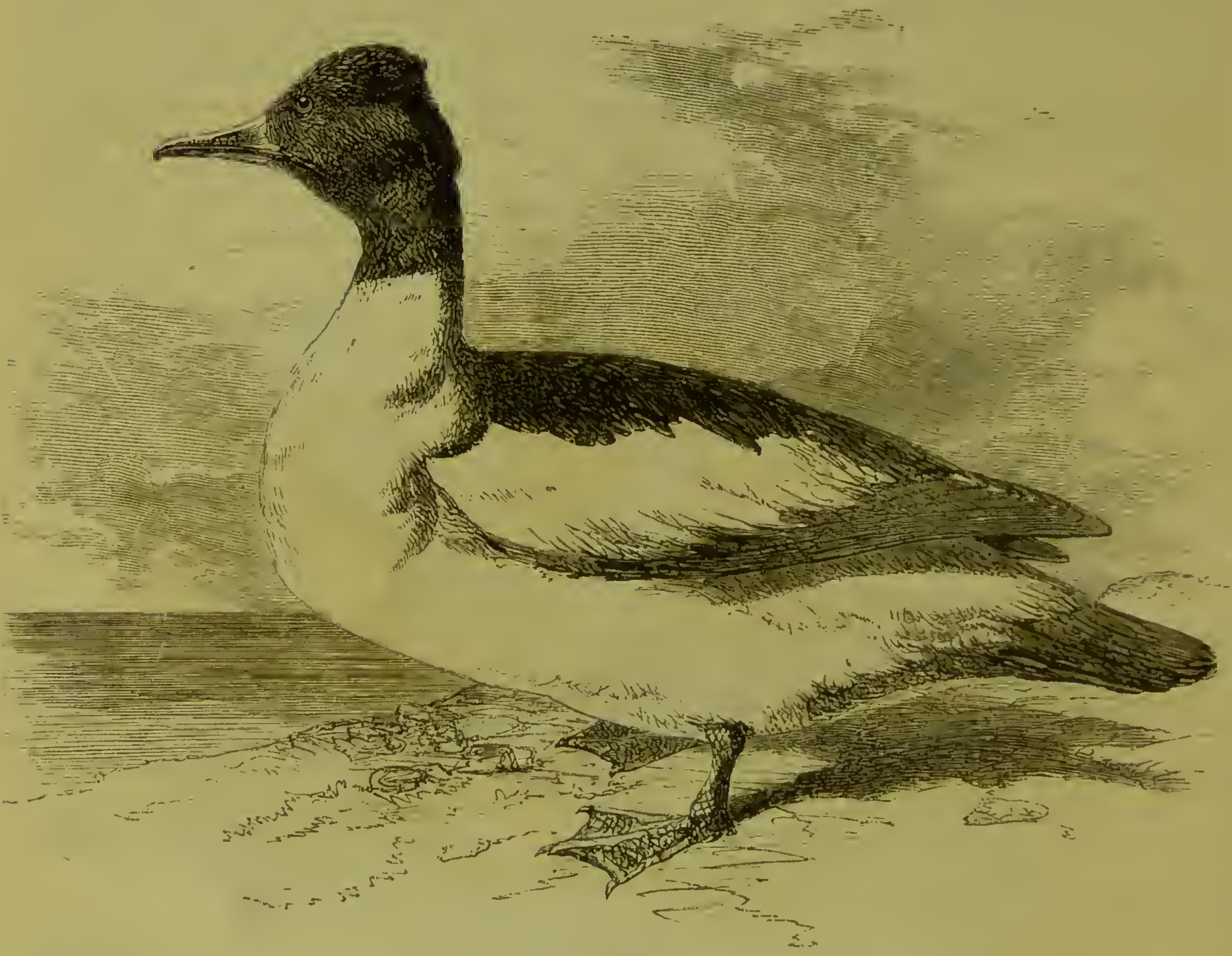
* Anser bernicla.

So much for grave statement; another, of a different kind, is thus given by Lady Fanshawe, who was in France in 1649:—"When we came to Calais, we met with the Earl of Strafford and Sir Kenelm Digby, with some others of our countrymen. We were all feasted at the governor's of the castle, and much excellent discourse passed; but, as was reason, most showed, was Sir Kenelm Digby's, who had enlarged somewhat more in extraordinary stories than might be averred, and all of them passed with great applause and wonder of the French then at table: but the concluding one was, that barnacles, a bird in Jersey, was first a shell-fish to appearance, and from that, sticking upon old wood, became in time a bird. After some consideration, they unanimously burst out into laughter, believing it altogether false; and, to say the truth, it was the only thing true he had discussed with them. That was his infirmity, though otherwise a person of most excellent parts, and a very fine-bred gentleman."


THE GOOSANDER.

THE NEW HOLLAND CEREOPSIS.*

This remarkable bird is a native of New Holland, on several parts of which it is very abundant; it does not, however, visit the interior, but is confined to the borders of the sea, and especially to the small islands adjacent to the mainland.

The characters which distinguish this bird from the geese, though not very important, are well marked, and embrace striking modifications of various organs. They consist chiefly in the form of the bill, the naked part of which is extremely short, and forms a kind of truncated hook; in the large open nostrils placed near the middle of the cere, which is very broad, and leaves but a small portion of the bill uncovered; in the somewhat greater length of the legs, which are bare of feathers for some distance above the knees; in all the toes being more robust; and in the number of tail-feathers, which are sixteen in the cereopsis, while there are only twelve in the goose.

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* Cereopsis Novæ Hollandiæ.

THE GOOSANDER.*

The birds belonging to the genus *Mergus* live on lakes, ponds, and rivers. They destroy a vast abundance of fish, and, for their destructive powers in this respect, have been compared to the otters.

THE CRESTED, THE HORNED, THE EARED, AND THE LITTLE GREBE.

It is for the purpose of retaining the slippery fish that the mandibles and tongues of these birds are furnished with dentilations and papillæ, which facilitate the entrance of food into the gullet. So great is the bulk of the fish that they sometimes swallow, that they cannot be introduced completely into the stomach, the body descending there only when the head is digested. The gizzard of the Merganser is less muscular than that of the ducks; their intestines and cæca are shorter; the swallowing part of the lower larynx in males is enormous, and partly membranous.

THE GREBES.†

The Grebes live on lakes and ponds, and build in the rushes. They swim with equal facility either on or beneath the surface of the water; in the latter case they use their wings as if flying in the liquid element. Their food consists of fishes, insects, and aquatic reptiles; but the stomach, when dissected, is usually found to contain a mass of feathers, which it would appear the bird had taken from its own plumage.

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* Mergus merganser.

† Podiceps.

The title given to this genus of birds refers to the lobated form of their toes, which differ from those of every other race of aquatic birds. Instead of being webbed, as in the duck tribe and others of the *Natatores*, they are completely separate and flattened, having their edges furnished with a broad, stiff membrane, each toe being, in fact, a distinct and beautifully-formed paddle. Of the three anterior toes, the outermost is the longest and largest; the next is nearly as large, and its outer edge lies tile-like over the inner membrane of the outermost; the innermost toe is less than the middle one, on which its outer edge impinges. The hind toe is short, placed high on the leg, and furnished with a lobated membrane. The arrangement of the scales crossing the toes gives to them a leaf-like appearance; for the lines dividing the scales run in regular succession obliquely upwards from a central line or shaft, formed by the bones advancing to the tips, which are covered with a broad, flat nail. The leg is short, and flattened laterally, so as to cut the water when drawn up after each stroke. The largeness of the outer toe, at the first glance surprising, is a necessary and beautiful provision; for, by this arrangement, the impetus of the stroke of each foot is carried in a line obliquely forwards to the anterior part of the chest, to which it converges; while, were the structure arranged differently, the line of the impulse of the stroke would diverge from the body, and there would be a waste of power.

The nests of these birds are placed among the thick reeds and luxuriant aquatic herbage of marshes, or the sedges which border fresh-water lakes and rivers. They are composed of masses of half-decayed roots, dried flags, and other similar materials. Each one is large and compact, but roughly constructed, and rises and falls according to the rise and fall of the water on which it floats. There are three or four eggs.

The Crested Grebe * is the largest of the genus. It breeds annually amidst the moors and fens of our marshy districts. As the winter sets in, and the still waters begin to freeze, it migrates to the larger rivers, and there moults, where it obtains fish and small crustacea, which form its winter food. When Mr. Selby was making a tour through Holland, accompanied by Sir W. Jardine, he gave chase to a crested grebe on one of the lakes in the neighbourhood of Rotterdam, and, though in a boat conducted by those most accustomed to the business, it cost severe exertion for upwards of an hour and a half to get within range, and secure it by a shot through the neck. The Horned Grebe † is plentiful in the north-east of Europe, in Northern Asia, and in North America. Dr. Richardson found it in the fur countries, frequenting every lake with grassy borders. The Eared Grebe ‡ occasionally breeds in the eastern counties of England, and is common in the northern parts of Europe. The Little Grebe § is the smallest and most interesting of the grebes. It is common in all the southern counties of Britain, wherever ponds and small lakes, fringed with reeds and dense herbage, offer it a refuge. Shy and wary, on the least appearance of danger it dives instantly, and takes shelter amidst the reeds, where it is effectually concealed.

THE DIVERS.||

The Divers nearly resemble the grebes, from which they differ but little, except in their palmated feet. Like them, too, while on the land they are beset with difficulties in their locomotions; on the water, they are entirely at ease.

In these birds the legs are situated more posteriorly than they are in any other bird. This causes their walking to be painful, and obliges them, when on shore, to preserve a vertical position. As, moreover, the greater part of them are bad fliers, and as many of them cannot fly at all, on account of the extreme shortness of their wings, they may be considered as almost exclusively confined to the surface of the water. In consequence of this their plumage is closer, and it often presents a smooth surface, with a silvery brightness. They swim under water with the help of their wings, almost in the manner of fins. They have a peculiar muscle on each side the lower larynx.

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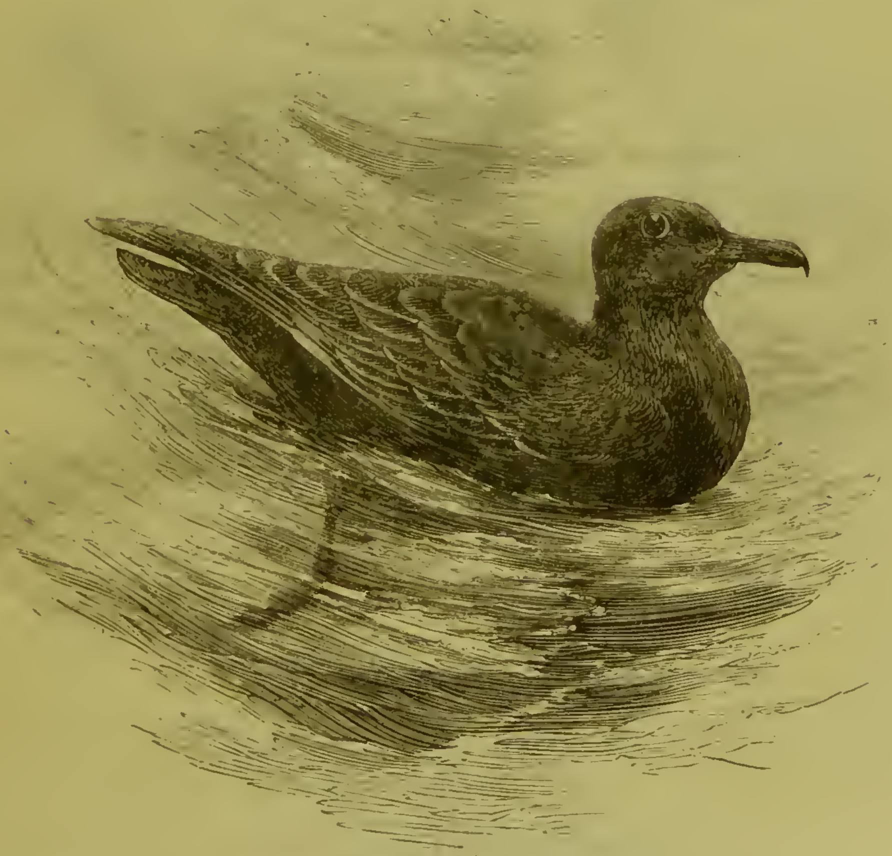
* Podiceps cristatus. † Podiceps cornutus. ‡ Podiceps auritus. § Podiceps minor. || Colymbidæ.

DIVERS AND PUFFINS.

THE COMMON SKUA.*

The Skua is the largest and most remarkable of the gulls.† It inhabits the Arctic regions of Europe, Asia, and America, and is very abundant in the Orkneys and Shetland Isles, breeding in communities upon Foulah, Unst, and Rona's Hill, in Mainland. It is a rare and occasional visitor in the southern part of Great Britain.

It is not merely bold, but ferocious in the breeding season. Selby says: "It will at that time attack even man, without hesitation, should he happen to approach the site of its nest; and so impetuous is its attack, that the natives of the Shetland Isles are compelled, on such occasions, to defend themselves by holding up a knife or sharp stick, on which the assailant has been frequently known to transfix and kill itself, whilst making pounces on the head of the intruder. Dogs, foxes, and other animals are instantly attacked, and so severely dealt with by the wings and beak of the strong, pugnacious skua, as to be soon driven to a hasty retreat, and no bird is permitted to approach with impunity; the eagle itself being beaten off with the utmost fury, should it happen to venture within the limits of the breeding territory."



THE COMMON SKUA.

In some places where these birds abound, they become the guardians of the young lambs, which the people consider perfectly safe in summer; and as a return for this protection, they are never molested, being held in no less esteem than the stork in Holland, or the ibis in Egypt. Other gulls are, however, exposed to the attack of these robbers, probably because, being the most diligent pursuers of fish, they are sure to find from their exertions a never-failing supply.

The nest of the skua consists of dried weeds. There are two eggs of a dark olive-green blotched with brown. The head is of a deep brown; the neck and the under plumage brownish-gray, marbled or tinged with reddish-brown. The bills and legs are black.

The duties of incubation being over, the skua retires from the open sea, and passes a solitary life during the winter, far from land.

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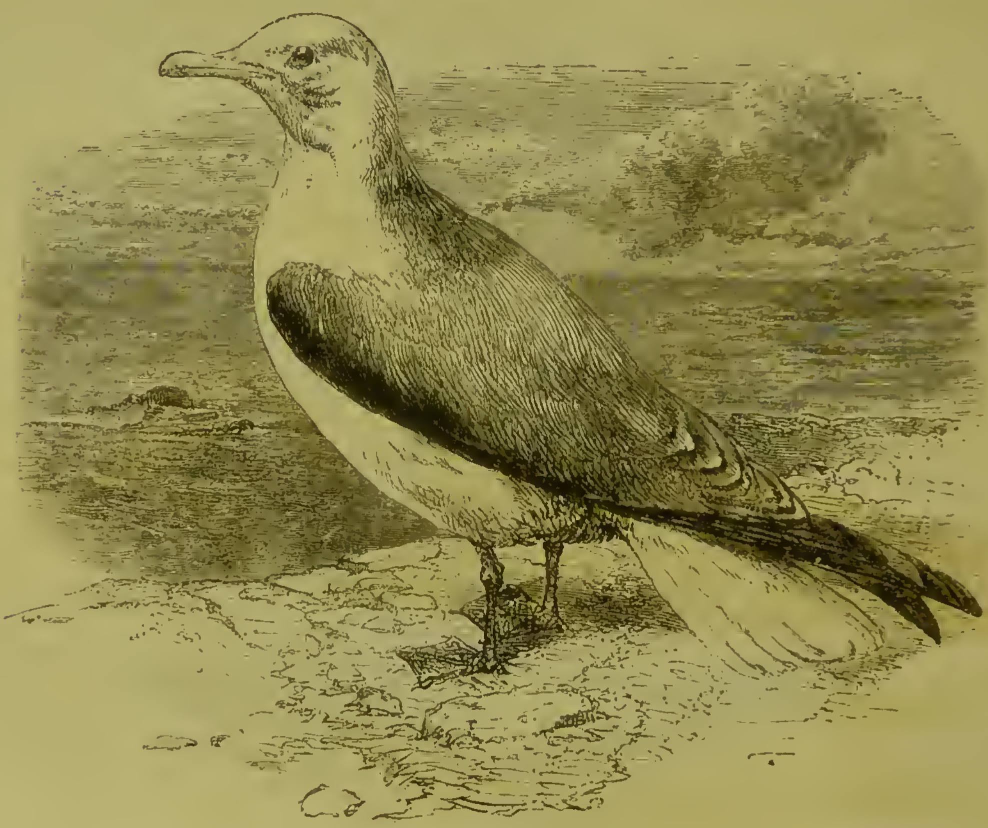
* Lestris catarractes.

† Laridæ.

THE COMMON GULL.*

THE Gulls are natives of every shore from north to south. Mant says truly :—

> " On nimble wing the gull
> Sweeps booming by, intent to cull,
> Voracious, from the billow's breast,
> Mark'd far away, his destined feast:
> Behold him now, deep plunging, dip
> His sunny pinion's sable tip
> In the green wave; now lightly skim
> With wheeling flight the water's brim,
> Wave in blue sky his silver sail
> Aloft, and frolic with the gale,
> Or sink again his breast to lave,
> And float upon the foaming wave:
> Oft o'er his form your eyes may roam,
> Nor know him from the feathery foam,
> Nor, 'mid the rolling waves, your ear
> On yelling blast his clamour hear."



THE COMMON GULL.

THE COMMON GUILLEMOT.†

THE birds which formerly built on the Fresh-water cliffs of the Isle of Wight were principally puffins, razor-bills, guillemots, and cormorants. "Their number," says Gilpin, "can only be described by the expression of darkening the air. They sit commonly, when they are not in motion, on the ledges of the cliffs, in the crannies of which they rear their young. You see them ranged in black files through a considerable space. The report of a gun brings them all out of their recesses; and the air, which a moment before was still and quiet, is now beaten with myriads of busy wings, and filled with screams and cries, as various as the tribes from which they issue."

The Common Guillemot inhabits the northern seas of Europe, Asia, and America, emigrating, in large troops, in winter to the coasts of Norway, the Baltic, Holland, and France, but more rarely wandering to the inland lakes of continents. It often breeds, in company with the auks, among the cliffs of the rocks, as in the Island of Priestholm, near Anglesea, the Fern Isles on the coast of Northumberland, and the precipitous rocks near Scarborough.

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* Larus canus.

† Uria troile.

THE PUFFIN.*

THE singular appearance of this bird, the contour of its figure, which is round, thick, and ball-like, and peculiar physiognomy, naturally attract attention. It makes its appearance at its customary breeding-places about the middle of April, and departs in August to winter on the southern coasts of Spain Italy, and other parts of Southern Europe. It is very numerous at the Needles in the Isle of Wight, on Priestholm Island, off the coast of Anglesea, Lundy Island, and at other places.

The length of the bird is thirteen inches. The bill is deeply furrowed, and bluish-gray at the base, the middle part orange-red, which deepens into bright red at the tip; the legs are orange-red. Perched on the cliff of the craggy precipice, the puffin looks down with eager gaze on the sea beneath, and skilfully throws itself into the abyss. Here it expertly swims and dives; its food consisting of the smaller fishes, and especially the young of the sprat.

THE COMMON GUILLEMOT.

THE GREAT AUK.†

THE true Auks‡ breed in large companies, in caverns and rocky cliffs, laying only one disproportionately large egg. They obtain their food by diving, in which they are materially assisted by their wings as well as by their feet. It consists of small fish, crustacea, and other marine animals. The young are said to be fed from the crops of their parents, not only before, but after they are able to leave the place of their birth.

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* Mormon fratercula.—Ill.

† Alca impennis.

‡ Alca.

The Great Auk is an inhabitant of the Arctic Seas, but its history has not yet been satisfactorily traced. Dr. Fleming, however, gives an account of one taken alive at St. Kilda, where they are sometimes known to breed. It is generally considered as rarely visiting the British Isles. Its length is somewhere about three feet, and its wings are destitute of the feathers requisite for flight. The wings are very short, not exceeding four inches and one-fourth from the tips of the largest quill-feathers to the first joint, and though useless for the purposes of flight, are very serviceable in swimming under water. The great auks frequent the frozen seas as far north as navigators have penetrated, seldom straying far from land or floating ice, and yet never quitting the water but for the purposes of breeding, being nearly as unfit for walking as for flying, and when on shore, like other auks and penguins, holding themselves in a nearly vertical position.

THE PUFFIN.

The Penguins* constitute a group of oceanic birds peculiar to the Southern Ocean. They are not intertropical, but range from the frigid to the temperate latitudes south of the tropic of Capricorn, and in these seas take place of the auks, and especially of the great auk of the Northern Ocean.

In some of the water birds the limbs seem, like the hinder flappers of the seal, to terminate the body, and are, moreover, modified with efficient paddles. But in the penguin the situation of the legs is so posterior, that, in order to maintain its balance when on shore, the bird is obliged to stand upright and to hobble along in this singular attitude. A flock of these birds, standing in array on the sea-shore, has a novel and very remarkable appearance; for, being collected in long ranks, they resemble a

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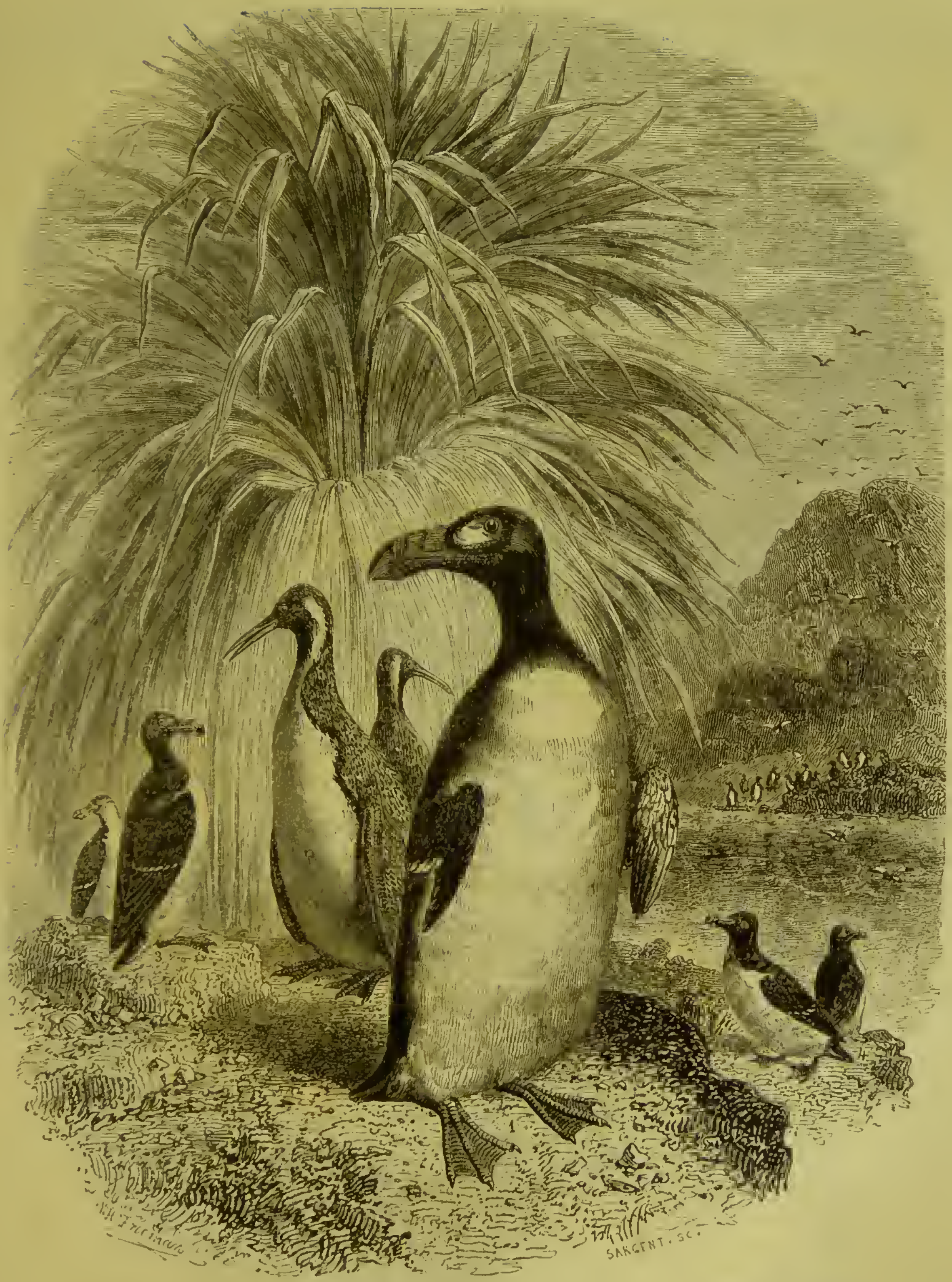
* Aptenodytes.



1. GREAT AUK. 2 & 4. THE BLACK-BILLED AUK. 3. THE KING PENGUIN.

marshalled body of soldiers. The tarsi are very short and strong; the toes are three in number, united by intervening webs, besides an inner toe in a rudimentary condition, directed backwards. The Great Auk is a native of the Arctic Seas; the Little Auk* is a winter visitor in England.

The feet of the penguin serve not only as paddles, but to some extent as a rudder; for the tail is very small, and in some species reduced to the minimum of development. Its chief organs of aquatic progression are, however, its paddle-like wings. In the great auk the wings are also paddles, but they are less completely so, inasmuch as the usual feathers of these organs are to be made out, though they are extremely short and small. In the penguin, on the contrary, the paddles are always covered with layers of small, rigid, scale-like feathers, lying as closely as possible, and forming a thin but compact covering to the skin.

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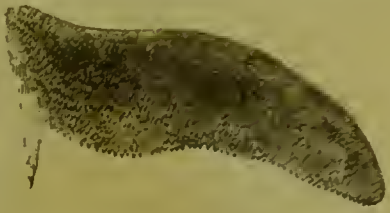
* Mergulus melanoleucos.

HEAD OF PENGUIN.



WING OF PENGUIN.

THE TERNS.*

The Terns have also been called *Sea-swallows*, from the resemblance of their forked tail, their long wings, and their constant habit of shaving the surface of the water in all directions, in pursuit of small fish, to those of swallows.

The terns are continually on the wing, and, though web-footed, are not seen to swim. They rest but seldom, and only on the land. Their food consists chiefly of small fish and mollusks, which they seize on the surface of the water; but they also catch aërial insects. They send forth sharp and piercing cries in flying, particularly during nestling time. In calm weather they sometimes rise very high, and are often seen to come plump down.

THE COMMON TERN.†

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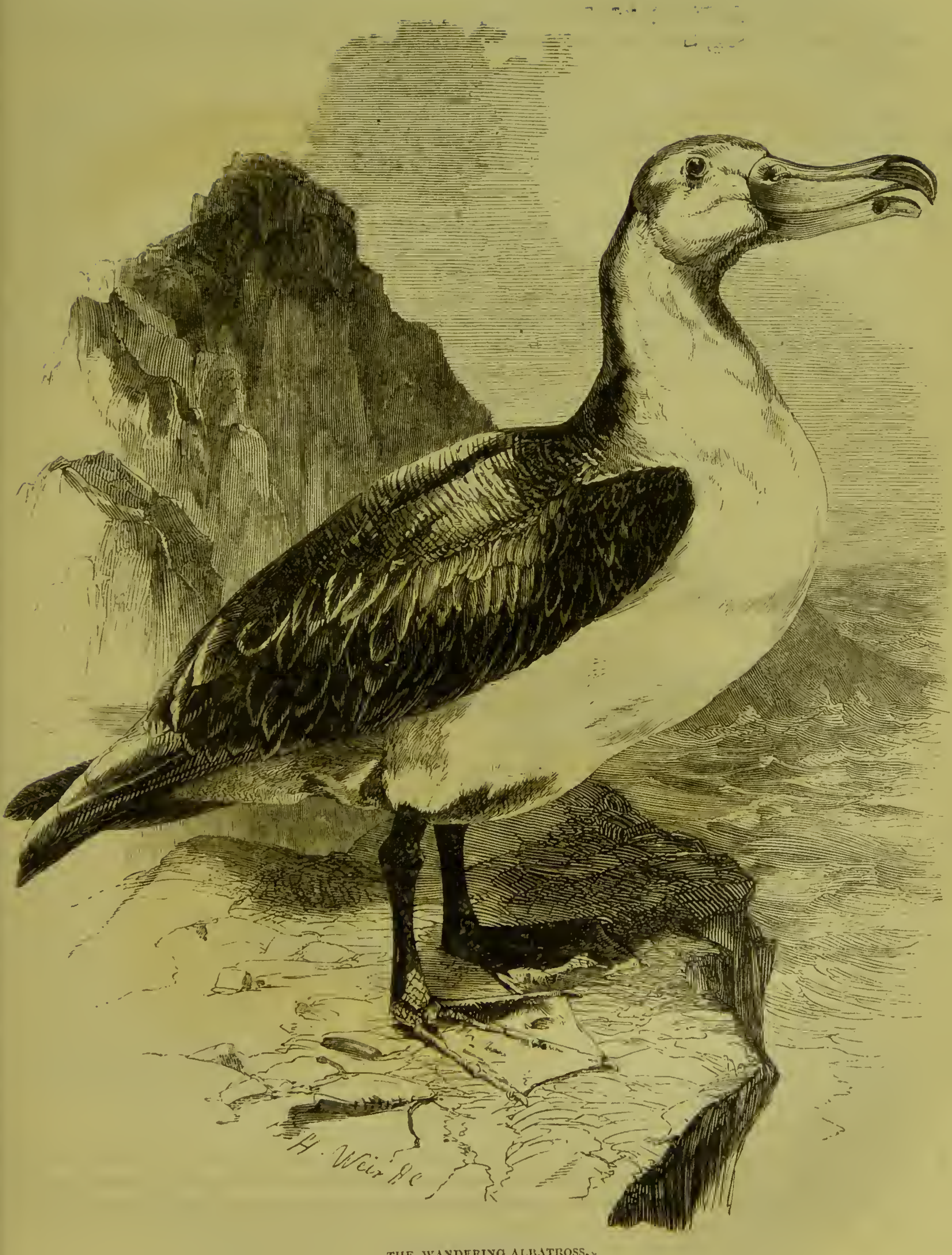
* Sterna.

† Sterna hirundo.



THE WANDERING ALBATROSS.

The young differ from the adult and aged only before the moulting, which is double in the known species. There is no external difference between the sexes. The females deposit their eggs, usually two or three in number, in a cavity, and these nests are sometimes so close that the sitting birds touch each other.

Terns are, some assert, found in both continents, from the seas, lakes, and rivers of the North, as far as the vast coasts of the Austral Ocean, and in almost all the intermediate climates. In Tahiti they rest upon the bushes; and Forster, in a walk before the rising of the sun, has caught many of them that were sleeping along the pathways. The species are very numerous.

THE WANDERING ALBATROSS.*

THE Wandering Albatross is the largest of all the birds that frequent the sea-coast; it measures three feet in length, while the extent of its wings is variously stated. Forster says it is about ten feet; Parkins, eleven feet seven inches; Cook, eleven feet; another authority says twelve feet; a specimen in the Leverian Museum measured thirteen feet; and Ives describes one, shot off the Cape of Good Hope, which measured seventeen feet and a half from wing to wing. "How powerful," says Dr. Arnott, "must be the wing muscles of birds which sustain themselves in the air for hours together! The great albatross, with wings extending fourteen feet or more, is seen in the stormy solitude of the Southern Ocean, accompanying ships for whole days, without even resting on the waves."

THE FULMAR PETREL.

From the great weight of the birds they have much difficulty in raising themselves into the air, which they do by striking the surface of the water with their feet, but when once on the wing their flight is rapid. It is apparently performed with great ease, as they appear to do little more than sway themselves in the air, sometimes inclining to the left and at other times to the right, gliding with great rapidity over the surface of the sea. It is only in bad weather that their flight is at any great elevation. Their voice resembles the braying of an ass.

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* Diomedea exulans.

THE FULMAR PETREL.*

The Fulmar Petrel is always abundant in Davis' Straits and Baffin's Bay, and it is common in the icy seas. It appears, however, to be migratory, as Captain Sabine, when detained in Jacob's Bay, saw these birds passing in a continual stream to the northward, in numbers only inferior to the flight of the "passenger pigeon" of North America.

They visit the rocky St. Kilda, one of the western isles of Scotland, in spring, and find temporary abodes there in holes and caverns. The natives risk their lives, scaling the tremendous and overhanging cliffs in search of the young, from whose bodies they obtain down and oil.

"No bird," says Pennant, "is of such use to the islanders as this; the fulmar supplies them with oil for their lamps, down for their beds, a delicacy for their tables, a balm for their wounds, and a medicine for their distempers."

THE STORMY PETREL.

The fulmar is nearly as large as a gull, while the stormy petrel is about the size, and in appearance not unlike, the swift, or largest swallow.

THE STORMY PETREL.†

The Stormy Petrel, or "Mother Carey's Chicken," is seen by navigators in every part of the ocean skimming over the surface of a heavy rolling sea. Before a storm, these birds flock under the wake of a ship, and are looked upon by sailors as foreboding evil. "But," says that accurate naturalist,

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* Procellaria glacialis.

† Procellaria pelagica.

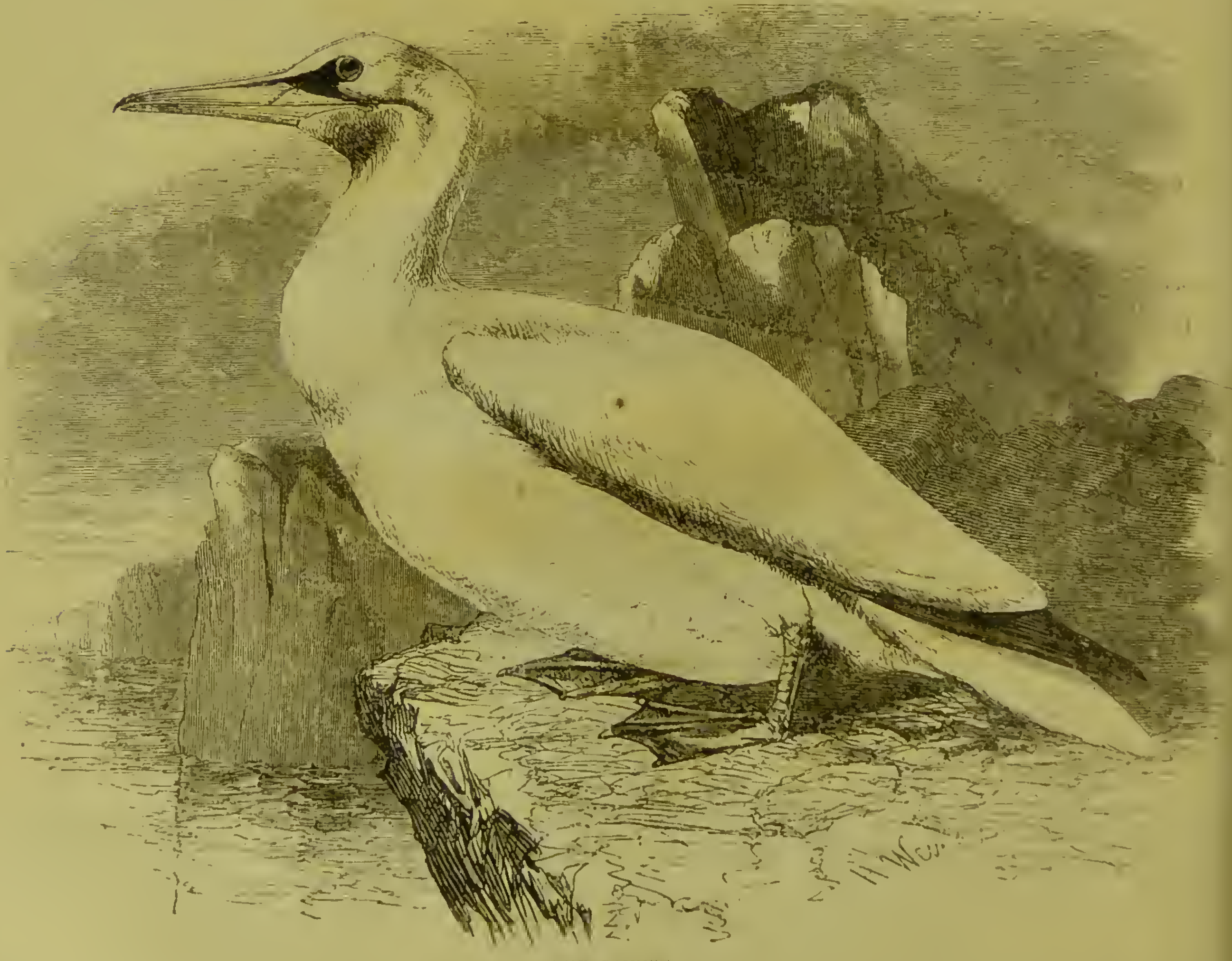
Alexander Wilson, "as well might they curse the midnight lighthouse, that, star-like, guides them on their watery way, or the buoy, that warns them of the sunken rocks below, as this harmless wanderer, whose manner informs them of the approach of the storm, and thereby enables them to prepare for it."

Barry Cornwall thus sweetly sings :—

" A thousand miles from land are we,
Tossing about on the roaring sea ;
From billow to bounding billow cast,
Like fleecy snow on the stormy blast :
The sails are scattered abroad like weeds,
The strong masts shake like quivering reeds,
The mighty cables, and iron chains,
The hull, which all earthly strength disdains—
They strain and they crack, and hearts like stone
Their natural hard proud strength disown.

" Up and down ! up and down !
From the base of the wave to the billow's crown,
And amidst the flashing and feathery foam
The Stormy Petrel finds a home—
A home, if such a place may be,
For her who lives on the wide, wide sea,
On the craggy ice, in the frozen air,
And only seeketh her rocky lair
To warm her young, and teach them to spring
At once o'er the waves on their stormy wing !

" O'er the deep ! o'er the deep !
Where the whale, and the shark, and sword-fish sleep,
Outflying the blast and the driving rain,
The Petrel telleth her tale—in vain ;
For the mariner curseth the warning bird,
Who bringeth him news of the storm unheard !
Ah ! thus does the prophet, of good or ill,
Meet hate from the creatures he serveth still ;
Yet *he* ne'er falters :—so, Petrel, spring
Once more o'er the waves on thy stormy wing !"

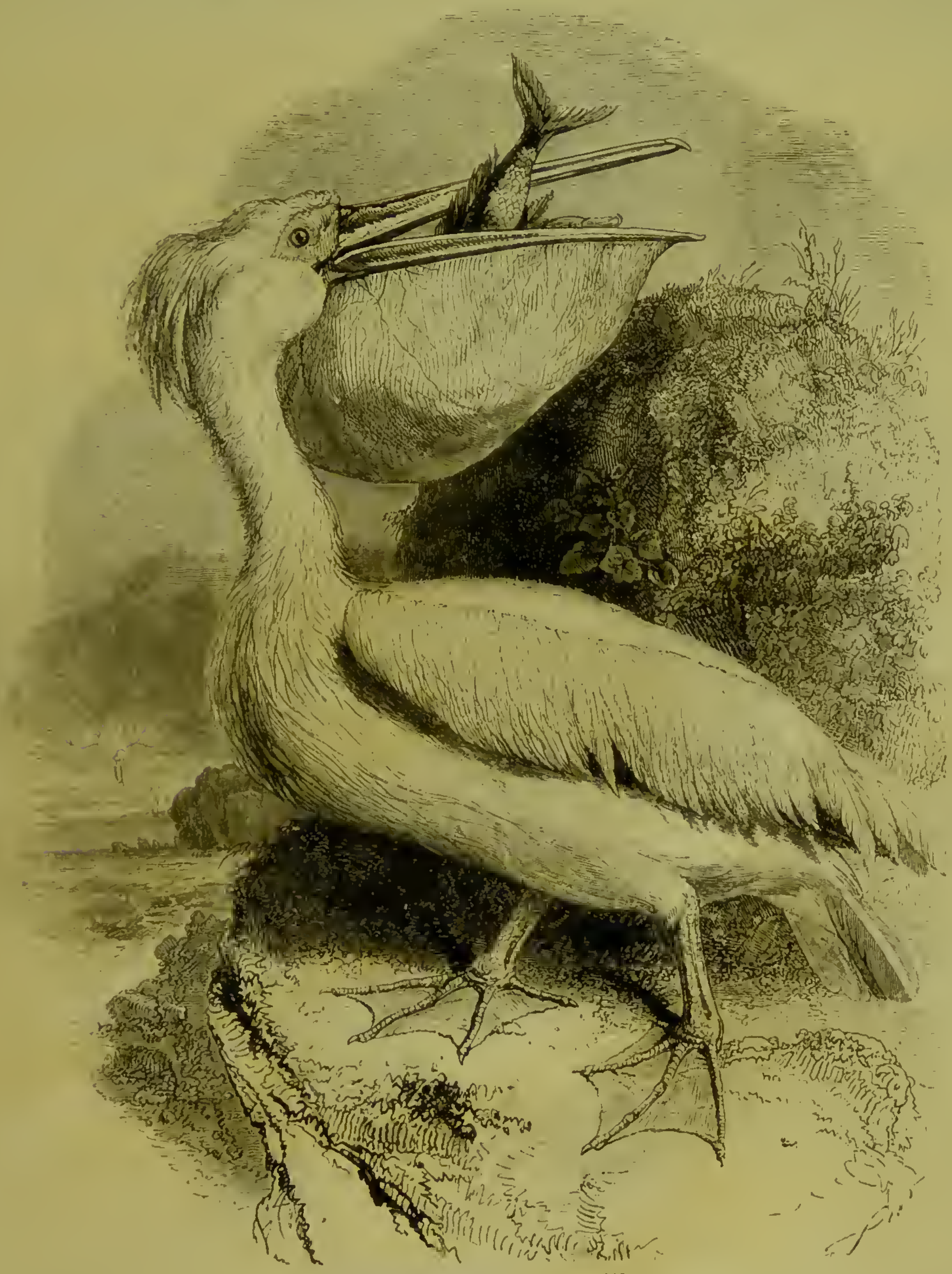


THE GANNET.

The whole of the family of the Petrels are characterised by the strength and expansiveness of their wings, with the aid of which they traverse immeasurable tracts of the ocean in search of food, and support their flight at considerable distances from land, seldom having recourse to their power of swimming.

THE GANNET.*

The Bass Rock, at the entrance of the Frith of Forth, and some of our northern isles, are the annual resorts of this bird, often called the Solan Goose, for the purpose of incubation. The nests are placed on the ledges and projections of the rocks, where multitudes breed in harmony together.



THE WHITE OR COMMON PELICAN.

THE WHITE PELICAN.†

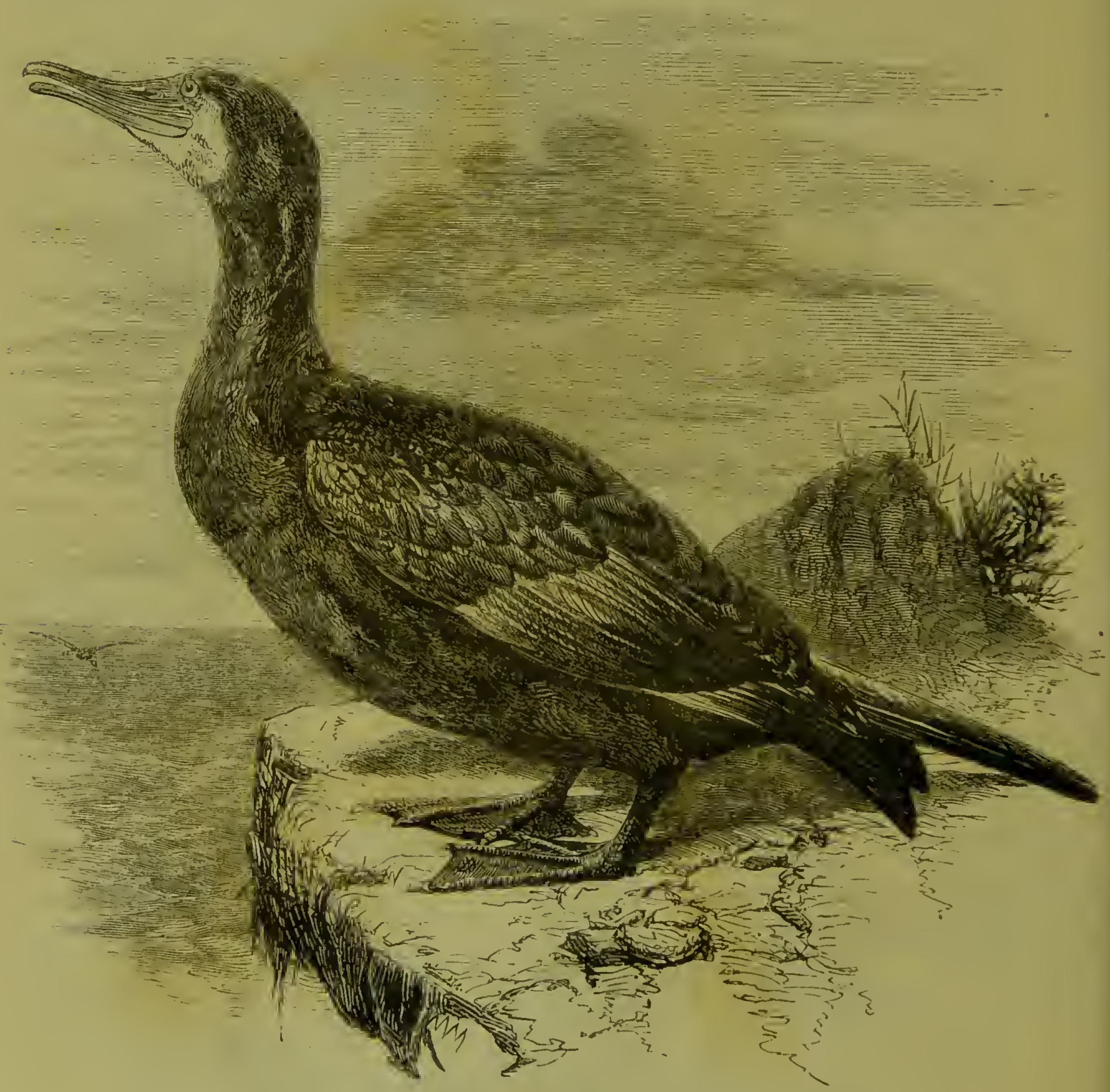
This bird is not uncommon in several of the warmer countries of Europe, whence it sometimes wanders into more northern latitudes. It is the largest of the swimming birds. So highly dilatable is its pouch, as to be capable of containing two gallons of water; the number of fish it can hold may, therefore, be easily imagined.

* Sula Bassana.

† Pelecanus onocrotalus.

THE COMMON CORMORANT.*

The Cormorant, or Corvorant, as it is sometimes called, inhabits the New as well as the Old Continent. In the latter it is very widely diffused, being spread over a considerable portion of Europe, especially the North; and is common in England.



THE COMMON CORMORANT.

This bird swims very low in the water; even in the sea the body is deeply immersed, little more than the neck and head being visible above the surface. It dives most expertly, pursuing the fish that forms its food with great activity under water. It flies with the neck outstretched, and may often be seen drying its drenched plumage on the shore, or on insulated rocks.

Another species of this bird is the Cormoran Largup of Temminck, the Crested Corvorant of

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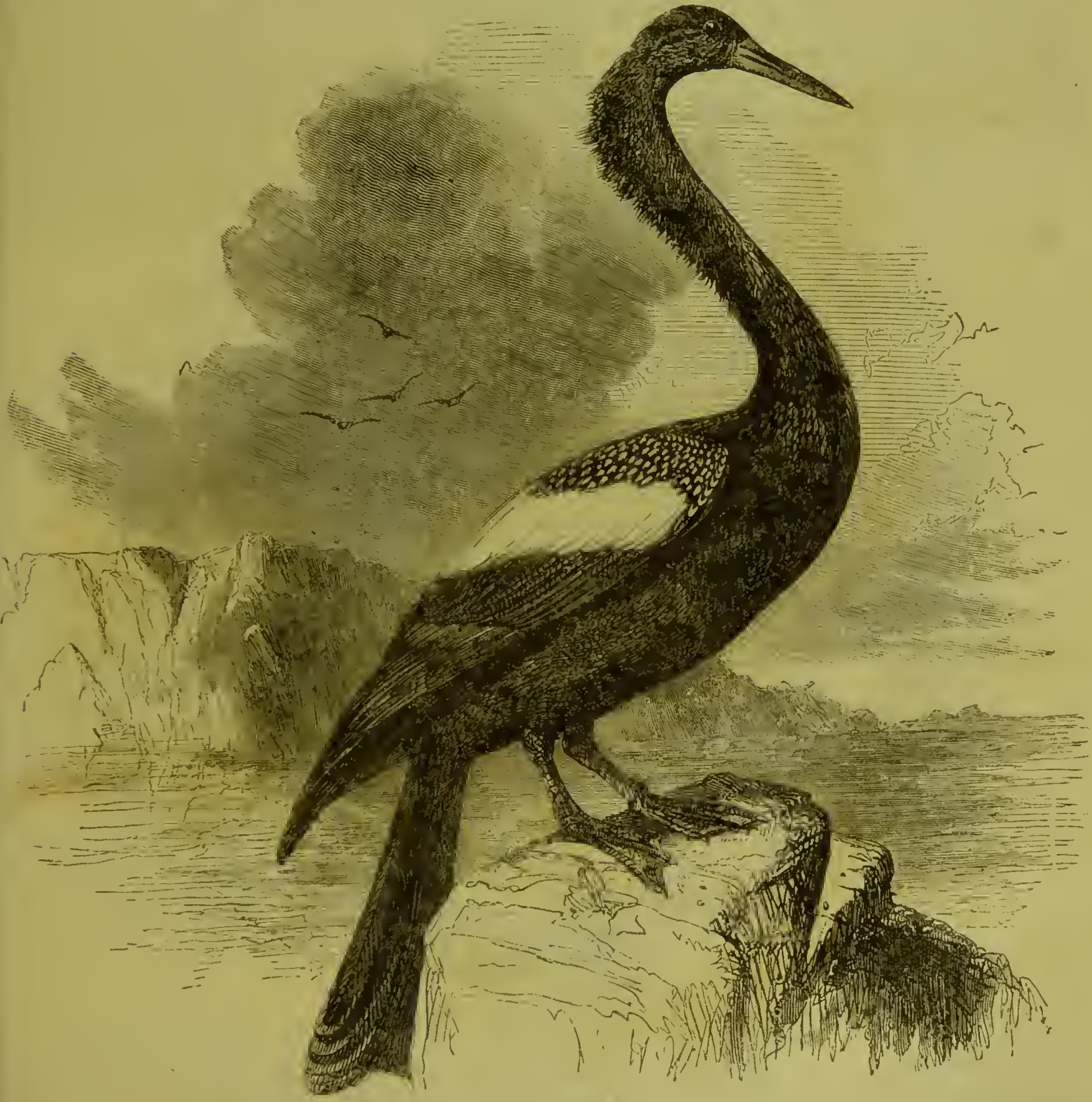
* Phalacrocorax carbo.

Pennant,* and the Shag, or Green Cormorant of Gould. In the old bird in its winter dress, the entire plumage is of the most beautiful resplendent and lustrous green. At the commencement of the spring there arises on the middle of the head, between the eyes, a fine tuft of wide and outspread feathers, about an inch and a half high, capable of erection, and which in that state presents a toupet, or large plume; on the occiput, also, are ten or twelve rather long and sublulate feathers. There are never any white feathers on the neck, nor on the thighs, as in the common cormorant. The shag is found throughout the north of Europe; it is very common in Iceland, the Orkneys, Feroe Islands, Norway, and Sweden, in the vicinity of great lakes.



THE DARTER.

THE DARTER.†

These extraordinary birds are well described by Buffon when he says:—"The Anhinga offers us a reptile grafted on the body of a bird." Those who have seen the long neck of a Darter, and that only issuing from the water, twisting about above the herbage and among the foliage, say that it might easily be taken for a snake. Le Vaillant states that the neck of the species seen by him in Africa was always oscillating when the bird was perched; and that any one who saw its tortuous movements among the foliage, the body being concealed, would take it for one of the tree-serpents.

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* Phalacrocorax cristatus.

† Plotus anhinga: Linnæus.

THE TROPIC BIRD.*

The Tropic Birds, so well known to navigators, form a genus distinguished at once by the two long slender tail-feathers. Their length of wing and comparatively feeble foot proclaim them formed for flight, and accordingly they disport in the air far out at sea, swift and untired. They rarely repair to the land for any length of time, and when there, at the period of nidification, perch on rocks and trees.

Their habitual domicile in the Torrid Zone does not separate them from the land; and they can reach, as they do nearly every night, the isles and lofty rocks that serve them as a place of refuge. M. Lesson, however, so often met with them on sea-tracts entirely devoid of land, and heard them so often above his head in the calm and fine tropical nights, that he thinks they should be considered as oceanic birds. The Tropic Bird is about the size of a partridge.

THE TROPIC BIRD.

THE FRIGATE-BIRD.†

This bird is among the most singular of the feathered race. Its province is not water, but the air; it neither swims nor dives, nor rests on the billows like the gull. Its feet are indeed webbed, but the webs are very partial; the tarsi, or legs, as they are generally called, scarcely half an inch in length—the whole limb being very short, and covered to the feet with long, loose feathers; the tail is long and forked, the wings of extraordinary spread, and the general plumage deficient in that close and downy texture which always characterises a bird whose *habitat* is the surface of the deep.

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* Phaeton etherius.

† Fregata aquila.

"The frigate-bird," says Mr. Darwin, "has a noble appearance when seen soaring in a flock at a stupendous height (at which time it merits the name of the condor of the ocean), or when many together are darting, in complicated evolutions, but with the most admirable skill, at the same floating object. They seem to take their food quietly, for between each descent they raise themselves on high, and descend again with a swift and true aim. If the object (such as offal thrown overboard) sinks more than six or eight inches beneath the surface, it is lost to the frigate-bird. I was informed at Ascension, that when the little turtles break their shells, and run to the water's edge, these birds attend in numbers, and pick up the little animals (being thus very injurious to the turtle fishing) off the sand, in the same manner as they do from the sea."

THE FRIGATE-BIRD.

The frigate-bird is met with hundreds of leagues from land; in fact, it resorts there only for hatching and rearing its young. Under ordinary circumstances it continues ever on the wing over the ocean, reposing on outspread pinions in the higher regions of the air, where, without any effort, it can remain suspended. For such a life, however, it has been expressly fitted by its Creator. Beneath the throat is situated a large pouch, capable of being distended with air from the lungs, with which—as well as the hollow bones of the wings—it immediately communicates. The bones of the wings themselves, besides being hollow, are extremely long and light; and thus the pouch and tubes form an apparatus analogous to a balloon, which requires little else but the wings to be spread to be enabled by its buoyancy to sustain the body in the atmosphere. This, however, is only one of innumerable instances, already observed, of the all-wise and benevolent adaptation of the creature to its circumstances, and to which others will be added as, in the next volume, we examine the structure and habits of REPTILES, INSECTS, FISHES, CRUSTACEANS, ZOOPHYTES, and ANIMALCULES.

SCIENTIFIC TABLE.

f. Family; *s. f.* Sub Family; *g.* Genus; *t.* Tribe; *s.* Species.

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CASSELL'S
POPULAR
NATURAL HISTORY.

REPTILES, FISHES, INSECTS, WORMS, CRUSTACEANS,
MOLLUSCS, SEA-STARS, ECHINODERMS, CORALLINES,
CORALS, AND ANIMALCULES.

VOLUME IV.

ILLUSTRATED BY NEARLY FOUR HUNDRED ENGRAVINGS.

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INTRODUCTION.

"THE cultivation of a fine taste for the beautiful works of Nature," says Dugald Stewart, "not only enables us to enjoy more fully those primary pleasures which are afforded by an appropriate object, but superadds to these a secondary pleasure, peculiar to itself, and of no inconsiderable value. The secondary pleasures connected with the study of Natural History, in even its minuter divisions, may be readily explained. They tend to excite a predilection for intellectual pursuits, in preference to such as are frivolous and unsatisfactory, and to quicken the general admiration of the wonders of creation. The primary are of a higher character. They are derived from a due consideration of the works of Nature in connection with their Divine Artificer; and the feelings associated with them are those of adoration and delight." Such was the conviction under which, four years ago, CASSELL'S POPULAR NATURAL HISTORY was undertaken; and it is no affectation to say that the production of such a Work, containing so many highly-finished illustrations, for so moderate a price, marks a new era in the publication of popular scientific literature. Much of the information which accompanies these illustrations is a recent addition to our stock of knowledge on this subject; for the higher orders of animals are now more accurately known than formerly, and the lower have but lately formed the subject of intelligent, careful, and persevering investigation.

Having devoted Two Volumes to the division of *Mammals*, and One to that of *Birds*, we commence the present Volume with *Reptiles*, which are no less marvellous in their structure and instincts than animals of the most attractive appearance.

After *Reptiles*, we treat of *Fishes;* and how various are they in form and magnitude!

> "The sounds and seas, each creek and bay,
> With fry innumerable swarm, and shoals
> Of fish, that, with their fins and shining scales,
> Glide under the green wave, in sculls that oft
> Bank the mid-sea; part single or with mate
> Graze, the sea-weed their pasture, and through groves
> Of coral stray; or, sporting with quick glance,
> Show to the sun their waved coats dropt with gold."

In this, as in the other orders, we find a wonderful adaptation of the creature to its peculiar circumstances. With Birds the great difficulty to be overcome is that arising from the *rarity* of the medium into which they are destined to soar; and everything in their organisation has a reference to this. With Fishes the difficulty is of an opposite character, being due to the *density* of the element in which they live ; and, to overcome this, a form has been given to them which is known to mathematicians as that of *the solid of least resistance.* Whatever may be the direction of our inquiries, we find that Science testifies how admirably everything has been contrived by Him who is "wonderful in counsel and excellent in working." At every period, both of ancient and modern times, fish has been highly valued as an article of food ; and a consciousness of its importance is not confined to polished nations ; it is recognised by the savage inhabitants of the most remote and inhospitable regions. The seas, the lakes, and the rivers of the earth constitute inexhaustible magazines of food, which has been munificently provided for us by Almighty wisdom and beneficence.

Insects next claim our attention, and abundantly illustrate the same Divine attributes ; impressing us with the truth of what Kirby has said : "No religious doctrine is more strongly established by their history than that of a superintending Providence."

From these diminutive but extraordinary beings we pass on to *Worms*, *Crustaceans*, *Molluscs*, and the *Radiata*, including Sea-stars, Corallines, Corals, &c. Some of these largely contribute to the sustenance of the human family ; and the lower forms of life, so marvellous in their construction, will be found not less worthy of investigation than the more important members of the Animal Kingdom.

The present Volume is concluded by an account of *Animalcules.* These constitute the food of many of the larger animals ; and, minute as they are—most of them being revealed to us only by the microscope—they have built up large portions of our globe. Well has it been said by Dr. Chalmers, as he viewed the telescope in connection with the microscope : "The one led me to see a system in every star ; the other leads me to see a world in every atom. The one taught me that this mighty globe, with the whole burden of its people and of its countries, is but a grain of sand on the high field of immensity ; the other teaches me that every grain of sand may harbour within it the tribes and the families of a busy population. The one told me of the insignificance of the world I tread upon : the other redeems it from all its insignificance ; for it tells me that in the leaves of every forest, and in the flowers of every garden, and in the waters of every rivulet, there are worlds teeming with life, and numberless as are the glories of the firmament. The one has suggested to me that beyond and above all that is visible to man, there may lie fields of creation which sweep immeasurably along, and carry the impress of the Almighty's hand to the remotest scenes of the universe ; the other suggests to me that, within and beyond all that minuteness which the aided eye of man has been able to explore, there may be a region of invisibles ; and that, could we draw aside the mysterious curtain which shrouds it from our senses, we might there see a theatre of as many wonders as astronomy has unfolded—a universe within the compass of a point, so small as to elude all the powers of the microscope, but where the wonder-working God finds room for the exercise of all his attributes ; where he can raise another mechanism of worlds, and fill and animate them all with the evidences of his glory."

Note.—The Proprietors think it right to state that, having arranged with a foreign house for the supply of certain of the engravings, they have since discovered, with great regret, that some few of these have infringed the copyright of engravings forming part of the beautiful and accurate series of works on the "Natural History of the British Islands," published by Mr. Van Voorst. The use of these illustrations is now retained in the Work by arrangement with Mr. Van Voorst.

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CASSELL'S
POPULAR NATURAL HISTORY.

REPTILES, FISHES, INSECTS, &c.

REPTILES.*

An acquaintance with reptiles may be traced backwards to a very remote period. The Sacred Scriptures, especially those of the Old Testament, have numerous passages alluding to them; and the ancient monuments of the Egyptians prove that the great groups of the tortoises, the lizards, the serpents, and the frogs were well known to that people. Those forms of animal life must, therefore, have attracted attention from the earliest times; while a natural desire to ascertain which of them were dangerous, and which innocuous, must have led to particular inquiry, in order to solve the doubt. It is evident, moreover, from the ancient writings of Athenæus, as well as of Herodotus, the father of history, and the contemporary of the prophet Malachi, that notions not merely vague but precise were entertained respecting many species of reptiles.

Reptiles form, unquestionably, a most remarkable class of animated beings. Some are of strange and uncouth aspect, and others, resplendent with burnished hues, glitter like steel and gold amidst the rays of the sun; not a few are strong and ferocious, and of all it may be said they supply abundant materials for interesting and instructive examination.

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* Reptilia, from *repto*, to creep along.

These creatures teem within the tropical latitudes. They tenant alike the land and the ocean; some prefer the river and the morass; while many are arboreal in their habits, flitting from spray to spray, and from leaf to leaf, in chase of insects. Reptiles swarm in sandy deserts, among dense and tangled brushwood, in humid forests, and in pestilential swamps; they colonise the ruins of ancient towns and cities, palaces and temples, and often lurk unsuspected in the dwellings of men.

In the more temperate latitudes of the globe the number of these animals is greatly diminished; none are terrible from their size, and very few are to be dreaded for their poison. Passing still farther northwards, a few species remain which are harmless, while one or two besides, though furnished with poison fangs, are capable only of destroying creatures of small size or a weak frame. The viper of Northern Europe is the representative in our latitude of the numerous deadly snakes which infest the countries of the tropics; and the harmless common ringed snake takes the place of the mighty python of Java and Bengal.

Advancing to the countries of the polar circles, we cannot find the snake, the lizard, the toad, or the frog. The low state of the temperature, the condition of the land and the water, and the deficiency of snails, insects, and other small animals, their usual food, combine to exclude reptiles from these desolate regions.

It has already been remarked[*] that reptiles, like birds, spring from an egg. The great marine tortoises, for example, come every year, at their appointed times, to deposit their eggs in the sand on the shores of the sea and banks of rivers, near strands of gentle declivity. There the females hollow out a sort of rude, but strong vaulted nest or oven, as it may be termed, wherein the eggs may have the benefit of the concentrated rays of the sun, so as to enjoy an equable heat, as in the instance of eggs under a sitting hen, but under circumstances which do not permit the body of the mother to impart the necessary warmth. The shell of these eggs is generally solid, and their form globular, or of a short cylindrical shape, equally rounded at the extremities. A female turtle will lay as many as a hundred at one time.

The reptiles differ from other animals in the mode of their respiration. Mammals breathe by expanding the cavity of the chest occupied by the lungs, into which, accordingly, the air enters, through the trachea, or windpipe, to fill up the vacuum occasioned by the dilatation of the cavity. Now, this action supposes a certain degree of mobility in the walls of the chest, or, in other words, of the ribs and sternum, or breast-bone,[†] which encircle it, independently of the action of the diaphragm—the great muscle of respiration, which parts the chest from the abdominal cavity; but in tortoises the walls of the chest are immovable; they cannot be expanded; the bones are all locked into one solid mass, and there is no diaphragm parting the cavity occupied by the heart and lungs from that containing the rest of the viscera. There must, therefore, be a peculiar mechanism by which the lungs become filled, and this is clearly discoverable.

If we watch a frog, for instance, we cannot readily discover that it breathes at all, for it never opens its mouth to receive air, and there is no motion of the sides to indicate that it respires; and yet, on any sudden alarm, the animal may be observed blowing itself up, as if by some internal power, though its mouth continues all the while to be closed. The throat, however, may be observed in frequent motion, as if the frog was economising its mouthful of air, and transferring it backwards and forwards between its mouth and the lungs; while, if we look to the nostrils, a twirling motion may be noticed at each movement of the jaws; for it is, in fact, through the nostrils that the frog receives all the air it breathes.

The jaws are never opened but for eating; and the sides of the mouth form a sort of bellows, of which the nostrils are the inlets, and by their alternate contraction and relaxation the air is swallowed, and forced into the trachea, so as to inflate the lungs. If the mouth of a frog be forcibly kept open, it can no longer breathe, because it is deprived of the power of swallowing the air required for that function; and if the nostrils be closed, in like manner it is suffocated.

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[*] "Cassell's Natural History," vol. iii., Birds, p. 1.

[†] "Cassell's Natural History," Mammalia, vol. i, p. 23.

The respiration of most of the reptile tribes is performed in a similar manner. The fact is, that the air is forced by the action of the tongue and mouth through the trachea into the lungs, by an act resembling that of swallowing; or rather, in the manner in which the ball or hollow butt of an air-gun is charged by repeated strokes of the piston.

The tortoises have lungs of great extent, passing backwards under the back-plate, and reaching to the posterior part of the abdomen. Turtles, which are aquatic, derive great advantages from this structure, which enables them to give buoyancy to the body—encumbered as it is by a heavy shell—by introducing into it a large volume of air; so that the lungs, in fact, serve the purpose of a large swimming-bladder. That such was the purpose of this structure is evident from the volume of air received into the lungs being much greater than is required for the sole purpose of respiration.

All reptiles are cold-blooded, sluggish, and inert; subsisting on a scanty allowance of food. The heart of tho frog may be regarded as consisting of a single ventricle and a single auricle. From the former there proceeds one great arterial trunk, which is properly the aorta. This soon divides into two trunks, which, after sending branches to the head and neck, bend downwards, and unite to form a single trunk, which is the descending aorta. From this vessel proceed all the arteries, which are distributed to the trunk and to the limbs, and these arterial ramifications are continued into the great venous trunks, which, as usual, constitute the *venæ cavæ*, and terminate in the auricle.

From each of the trunks which arise from the primary division of the aorta, there proceed the small arteries, which are distributed to the lungs, and convey to those organs a part only of the mass of circulating blood. To these pulmonary arteries there correspond a set of veins, uniting in the trunks which bring back the aërated blood to the auricle of the heart, where it is mixed with the blood which has returned by the *venæ cavæ* from the general circulation. Thus the blood is only partially aërated, in consequence of the lesser circulation being here only a branch of the greater.

The heart of the tortoise has two distinct auricles—the one receiving the blood from the pulmonary veins, the other, from those of the body generally; so that the mixture of aërated and vitiated blood takes place, not in the auricle, but the ventricle. When all the cavities are distended with blood, the two auricles being nearly of the same size as the ventricle, the whole has the appearance of the union of three hearts. On a similar plan the circulating system of the serpents is constructed.

In the chameleon each auricle of the heart has a large venous sinus, appearing like two supplementary auricles. The heart of the crocodile has not only two auricles, but its ventricle is divided by two partitions into three chambers. Each of the partitions is perforated, to allow of a free communication between the chambers; and the passages are so adjusted as to determine the current of aërated blood returning from the lungs into those arteries, more especially, which supply the head and the muscles of the limbs; while the vitiated blood is made again to circulate through the arteries of the viscera.

As the natural temperature of reptiles is not much, if at all, above that of the atmosphere or the water in which they dwell, the system is immediately affected by the lowering of the temperature of the medium they inhabit. In our climate, and in others much nearer the meridian, they all undergo a state of torpidity, in some sheltered retreat, to which, as a refuge, they repair, and where they remain during the severities of winter.

Mr. Darwin thus describes their hybernation, with that of insects, in South America:—"When we first arrived at Bahia Blanca (S. lat. about 39°), Sept. 7, 1832, we thought Nature had scarcely granted a living creature to this sandy and dry country. By digging, however, in the ground, several insects, large spiders, and lizards, were found in a half torpid state. On the 15th a few animals began to appear; and by the 18th (three days from the equinox) everything announced the commencement of spring. The plains were ornamented by the flowers of a pink wood sorrel, wild peas, œnothera, and geraniums; and the birds began to lay their eggs; numerous insects were slowly crawling about; while the saurian tribe, the constant inhabitants of a sandy soil, darted in every direction. During the first eleven days, while nature was dormant, the mean temperature, taken from observations under every two hours, on board the Beagle, was 51°; and in the middle of the day the thermometer seldom ranged above 55°. On the eleven succeeding days, in which all things became so animated, the mean was 58°, and in the range in the middle of the day, between 60° and 70°. Here, then, an increase of seven degrees in mean temperature, but a greater one of extreme heat, was sufficient to awake the functions of life.

"At Monte Video, from which we had just before sailed, in the twenty-three days included between the 26th of July and the 19th of August, the mean temperature from 276 observations was 58° 4′, the mean hottest day being 65° 5′, and the coldest 46°. The lowest point to which the thermometer fell was 41° 5′, and occasionally in the middle of the day it rose to 69° or 70°. Yet, with this elevated temperature, almost every beetle, several genera of spiders, snails, and land shells, toads, and lizards, were all lying torpid beneath stones. But we have seen, that at Bahia Blanca, which is four degrees to the southward, and therefore with a climate only a very little colder, this same temperature, with a rather less extreme heat, was sufficient to awaken all orders of animated beings. This shows how nicely the required degree of stimulus is adapted to the general climate of the place, and how little it depends on absolute temperature. It is well known that within the tropics, the hybernation, or more properly, estivation (summer torpidity), of animals, is governed by the times of drought. Near Rio Janeiro I was at first surprised to observe that, a few days after some little depressions had been changed into pools of water by the rain, they were peopled by numerous full-grown shells and beetles. Humboldt has related the strange accident of a house having been erected over a spot where a young crocodile lay buried in the hardened mud. He adds, the Indians often find enormous boas, which they call ugi, or water serpents, in the same lethargic state. To animate them, they must be irritated, or wetted with water."

The bodies of reptiles are either covered with horny plates or scales, spines, or granules, or, as in the ordinary amphibia, with a skin entirely naked. There is either no external organ of hearing, or only a simple orifice, open in some, in others covered by a transparent tympanic membrane, and in a few, with a movable valve. The number of the limbs never exceeds four. Some groups are destitute of limbs, the ribs greatly assisting in terrestrial locomotion. Most reptiles are carnivorous; some, however—and these belong to the first group, the tortoises—are vegetable feeders; a few feed both on small animals, as slugs and insects, and on leaves and fruits; and an extensive division of one order exhibits creatures formidable from their poison fangs, death rapidly following their bite.

Reptiles are divisible into four Orders :—

Order I.—Tortoises.[*]
„ II.—Crocodiles, Lizards, &c.[†]
„ III.—Snakes.[‡]
„ IV.—Frogs, Newts, Proteus.[§]

These diverse beings, of which we have given, as yet, only a general view, we shall now proceed more particularly to describe.

TORTOISES[||]

In hastily considering the skeleton of these animals, we are struck not only with the dispositions of the parts, but the remarkable inversion they appear to have undergone when compared with the arrangement ordinarily observable. We find, however, on a careful examination, that all the bones composing the skeleton in other vertebrated animals appear in the tortoise; and that the bony case which envelopes all the other parts, is really formed by an extension of the spinous processes of the vertebræ and ribs on the one side, and of the usual pieces which compose the sternum[¶] on the other.

The upper and lower plates thus formed are united at their edges by expansions of the sterno-costal appendices, which become ossified. Thus, no new element was created, but advantage was taken of those already existing in the general type of the vertebrata, to modify their forms, by giving them different degrees of relative development, and converting them, by these transformations, into a mechanism of a very different kind, and subservient to other objects than those to which they are usually applied. Thus, even the skeleton of the tortoise strikingly illustrates the unity of plan which has regulated the formation of all animal structures.

The most remarkable metamorphosis in the osseous system is that which occurs in the sternum.

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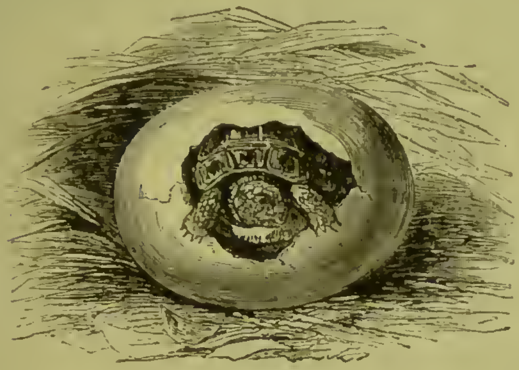
[*] Chelonia. [†] Sauria. [‡] Ophidia. [§] Amphibia. [||] Chelonia.

[¶] "Cassell's Natural History," vol. i., p. 23.

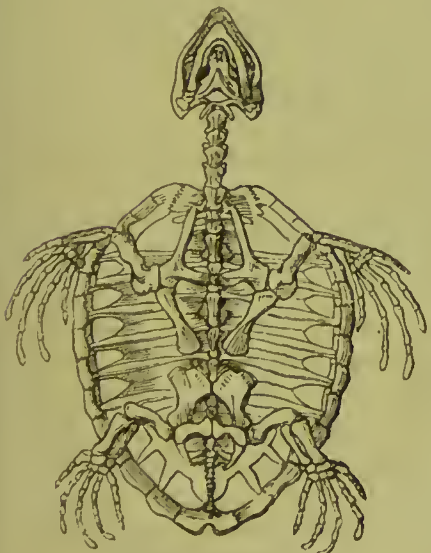
So expanded are all its parts, that it is difficult to recognise this bone under the disguised form of the broad plate which covers the whole of the under side of the body. Yet, by a careful examination of its structure, both in the young animal and also in the adult, where the sutures are not obliterated, we may easily recognise the nine elements of the sternum : namely, the one in the middle and fore part, and the four pairs of lateral pieces ; each having been formed from its respective centre of ossification. In form and relative proportion, indeed, they are widely different from the same parts as they appear in the skeletons of other animals ; yet, in number and in relative situations, they preserve that constancy and uniformity so characteristic of the wondrous and beautiful harmony which pervades the entire animal creation.



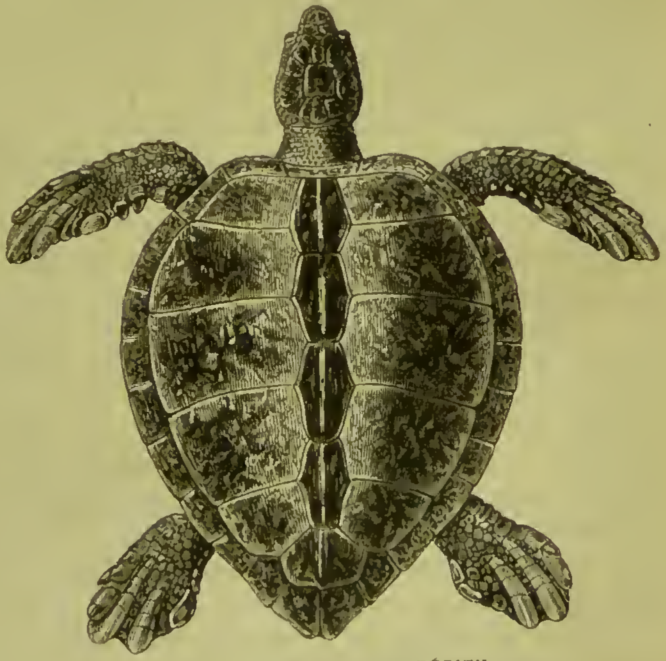
EGG OF THE TORTOISE.

TORTOISE NEWLY HATCHED.

In the turtles, the eight pairs of ribs and the thirteen plates of the longitudinal series form a slightly convex oval buckler, a little narrowed backwards. The ribs are not incorporated throughout their length ; a narrow fraction remains towards their exterior, and the intervals between this portion and that of the anterior and posterior ribs are filled up by a cartilaginous membrane only. In extreme old age, but then only, some are widened at the end. Cuvier mentions having seen the first three and a part of the fourth, in this state.



SKELETON OF TORTOISE.



TORTOISE IN ITS MATURITY.

In the fresh-water tortoises, and in one genus,* the buckler is entirely filled up in time ; and the ribs incorporate themselves throughout their length, between each other, and with the marginal pieces.

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* Chelys.

The ossification proceeds still faster in the land tortoises; and it is only in their youth that vacant spaces are observed between the external parts of the ribs.

The breast-plate is always composed of nine pieces; varying very much in figure, according to the genera and species. Of these, eight are pairs; and the ninth is odd, and always placed between the four anterior ones, with the first two of which it generally coheres, when it is not articulated with the four.

In the land and fresh-water tortoises and in *Chelys*, they only leave vacancies between each other in early youth, when they are formed by bony rays shooting in various directions in the still cartilaginous disc of the buckler, like the bones of the cranium in the fœtus of mammals; but, with age, these rays join each other from every side, and form a disc, compact in all its parts, which unites itself, by a more or less considerable extent, on each side to the dorsal buckler.

In the turtles and soft tortoises these radiating expansions do not unite throughout; and even when the four pieces in each side unite together, and the odd piece is joined to those on the first pair, there remain in the middle, between them all, and on each side between them and the dorsal buckler, great spaces which are filled up by cartilage only.

It is to be noticed, also, that as the plates which form this investing case are bony structures, they could not with any safety have been exposed to the action of the atmosphere. Hence, they are covered throughout with a thin horny plate, originally a production of the integument, which is generally known as tortoise-shell.

Thus, then, by a series of most remarkable processes, tortoises, like the armadilloes and pangolins* among the MAMMALIA, are clothed with natural armour; but it differs from that of those animals in being, not a simple horny addition to the skin, but part and parcel of the skeleton itself. The skeleton, in fact, is thrown to the outside of the body, so as to form an external bony covering, having a horny or leathery sheathing, and inclosing, as in a box, the internal organs and other portions of the osseous framework, which do not enter immediately into its composition.

On examining a common tortoise, we shall find the shell, as it is popularly termed, from which its head, limbs, and tail emerge, to consist of a vaulted portion, or buckler, covering the back; and an abdominal portion joined to the former, along the sides. The back-plate is termed the *carapace*, and consists of the vertebræ of the back and loins, and also of the ribs. The dorsal vertebræ, or those of the back, are not only immovable, but are strangely modified. The abdominal buckler is termed the *plastron*.

The carapace and the plastron are alike sheathed externally with horny plates, which are differently arranged. Sometimes they overlay each other, like great scales; but generally they are merely laid on the bone, and touch each other only at their edges. They vary in form, and in the direction of the raised lines and intervening furrows with which their surface is ornamented. These plates are the result of a secretion regularly carried on; and when one is removed during the life of the animal, it is gradually reproduced.

The jaws of tortoises are not armed with teeth, but are cased in horny coverings, resembling the sharp, hooked beak of a parrot, with which they crop and mince the vegetable aliment on which they feed. In some species, around the outside of this beak are thick, fleshy lips. The food consists of small living animals, as amphibia, young birds, and reptiles. In another species, the jaws, which open very wide, instead of being furnished with a strong beak, are protected with a delicate sheath of horn.

Notwithstanding the horny beak with which the jaws of tortoises are generally provided, the sense of taste is decidedly higher in these than in other reptiles. The tongue is thick, fleshy, very movable, and composed of numerous muscles; it is supplied with salivary glands and nerves of taste; nevertheless, it is not capable of being protruded from the mouth, the cavity of which it fills. In the land tortoise, in which the sense of taste is most perfect, its surface is thickly covered with papillæ; in the marine species it is smooth. In other aquatic groups its surface is more or less furrowed; and especially in those which inhabit marshes.

The eyes of tortoises resemble, in many respects, those of birds. There are always three eyelids:

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* Mammalia, vol. ii. pp. 344, 347.

two are external, continued from the common skin of the head, and vary in form in different genera; one is internal, and resembles the nictitating membrane* of birds; it is moved by muscles adapted to that service. As the internal olfactory apparatus occupies only a very limited space, the sense of smell appears at a low degree. In the river species the nostrils are prolonged into a sort of flexible proboscis, which the animals can raise for the purpose of respiration, between the large floating leaves of aquatic plants, while they lurk with their bodies concealed below them, and immersed in the water, there lying in wait for small birds, fishes, or frogs, on which they dart, and which constitute their food.

The internal auditory apparatus is extremely simple, having neither an external tympanum nor any orifice. In the matanata, however, there is a sort of triangular prolongation, formed by the integument of the skull, which seems to act as a valve to the orifice of an osseous auditory canal, and which widens outwardly. In the interior of this is a frame, on which the skin is stretched, so as to perform the office of a tympanum.

LAND TORTOISES.†

THE genera thus denominated are spread through the hotter and temperate parts of Europe, Asia, Africa, and America. In Europe there are three species, the Greek Tortoise,‡ the Bordered Tortoise, § and the Moorish Tortoise;|| but the latter are more common in Northern Africa than in Eastern Europe.

These creatures, in their natural state, lead a quiet, unobtrusive life; wandering, generally, but little from the spot where their existence commenced. The snake darts onwards swift as an arrow, the quick-eyed lizard can scarcely be seen as it passes; but the tortoise creeps slowly along, and, unable to escape danger by speed, withdraws his head and limbs on the approach of an enemy, and trusts in his natural armour for defence. The density of the carapace and plastron of the land tortoise is, indeed, very considerable; and the former, from its elevation and convexity, is capable of sustaining, uninjured, a high degree of pressure, thus preserving the internal organs. The plates of horn covering it are often most elegantly marked with alternate raised lines and furrows, and, at the same time, beautifully coloured.

Land tortoises, though they never enter the water, are frequently met with in the neighbourhood of lakes and rivers. Here vegetation is luxuriant, and the soil moist or soft—the latter circumstance being by no means unimportant; as they dig in the earth holes or burrows, in which, during winter, in extra-tropical latitudes, they bury themselves, and remain in a state of torpidity till the return of spring. It is, also, in holes which they dig that the females deposit their eggs, which are then covered up and left, the warmth of the sun being sufficient to bring them to maturity. Neither the eggs, nor the young ones hatched, are objects of solicitude to the parents.

The eggs are generally spherical, and covered with a calcareous shell of considerable firmness. The form of the young is very different from that of the species when fully grown. The carapace, for example, even in tortoises distinguished, when adult, by its elongated form, is almost hemispherical, and is always destitute of protuberances. It is remarkable that, like young chickens, tortoises have a hard tubercle at the end of the beak before being hatched, for the purpose, it is fairly presumed, of breaking their prison-shell.

Tortoises, in common with cold-blooded animals, whose circulation is languid, are remarkable for tenacity of life. They will not only bear serious injuries without death, but without much apparent suffering.

In ordinary circumstances the duration of the life of these creatures is very protracted. We are not sure, indeed, of the period at which, according to the laws of their physical system, they cease to live in their native regions; but we know that even in our uncongenial climate, instances are on record of tortoises attaining to what, compared with the life of man and quadrupeds generally, may be termed a very great age.

Murray, in his "Experimental Researches," in allusion to the Peterborough tortoise, gives us the

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* Birds, p. 13.

† Chersians.

‡ Testudo Græca.

§ T. marginata.

|| T. Mauritanica.

following interesting particulars:—"From a document belonging to the archives of the cathedral called the 'Bishop's Barn,' it is well ascertained that the tortoise at Peterborough must have been about 220 years old. Bishop Marsh's predecessor in the see of Peterborough had remembered it above sixty years, and could recognise no visible change. He was the seventh bishop who had worn the mitre during its sojourn there. Its shell was perforated, in order to attach it to a tree, and to limit its ravages among the strawberry borders.

"The animal had its antipathies and predilections. It would eat endive, green peas, and even the leek, while it positively rejected asparagus, parsley, and spinage. In the early part of the season its favourite food was the flowers of the dandelion (*Leontodon taraxacum*), of which it would devour twenty at a meal, and lettuce (*Lactuca sativa*): of the latter a good-sized one at a time; but if placed between the lettuce and the flowers of the dandelion, it would forsake the former for the latter: it was also partial to the pulp of an orange, which it sucked greedily.

THE PET TORTOISE.

"About the latter end of June (discerning the times and the seasons), it looked out for fruit, when its former choice was forsaken. It ate currants, raspberries, pears, apples, peaches, nectarines, &c.—the riper the better; but would not taste cherries. Of fruits, the strawberry and gooseberry were the most esteemed: it made great havoc among the strawberry borders, and would take a pint of gooseberries at intervals. The gardener told me it knew him well, and would watch him attentively at the gooseberry bush, where it was sure to take its station while he plucked the fruit.

"I could not get it to take the root of the dandelion, nor, indeed, any root I offered it, as that of the carrot, turnip, &c. All animal food was discarded, nor would it take any liquid, at least, neither milk nor water; and when a leaf was moist, it would shake it to expel the adhering wet.

"This animal moved with apparent ease, though pressed by a weight of eighteen stones: itself weighed thirteen pounds and a half. In cloudy weather it would scoop out a cavity, generally in a southern exposure, where it reposed, torpid and inactive, until the genial influence of the sun roused it from its slumber. When in this state the eyes were closed, and the head and neck a little contracted, though not drawn within the shell.

"About the beginning of October, or the latter end of September, it began to immerse itself, and had, for that purpose, for many years selected a particular angle of the garden. It entered in an inclined plane, excavating the earth in the manner of the mole; the depth to which it penetrated varied with the character of the approaching season, being from one to two feet, according as the winter was mild or severe. It may be added, that for nearly a month prior to this entry into its dormitory, it refused all sustenance whatever. The animal emerged about the end of April, and remained for at least a fortnight before it ventured on taking any kind of food. Its skin was not perceptibly cold: its respiration, effected entirely through the nostrils, was languid. I visited the animal for the last time on the 9th of June, 1813, during a thunder storm; it then lay under the shelter of a cauliflower, and apparently torpid." This tortoise died in 1821.

The Lambeth tortoise, which was introduced into the garden in the time of Archbishop Laud, about the year 1625, died from some neglect on the part of the gardener in 1753, having been in the garden 128 years. Gilbert White records several details of one which had lived thirty years in captivity, and states that another in an adjacent village was kept, "till by tradition it was supposed to be 100 years old." In some notes by Sir Robert Heron, Bart., who paid great attention to various animals, we find the following:—"1827. Mr. Reid, near York, has two water tortoises brought over from the siege of Belleisle, which commenced in 1761; one of them having wandered, was missing for sixteen years, when it was found on cleansing out another pond. Both are alive, and very tame." In 1827, therefore, they had been about sixty-six years in England. Several other instances of the longevity of the tortoise are on record. In the gardens of the Zoological Society, we have seen several specimens of huge Indian tortoises weighing upwards of 400 pounds, and their age has been estimated at not less than 200 years, which is probably below the truth, since their size, when first hatched from the egg, is small, and their growth slow.

The food of terrestrial tortoises is essentially vegetable, but earth-worms are said to be occasionally devoured. The numerous specimens which we have seen in the gardens of the Zoological Society, and elsewhere, have been fed with lettuce, cabbage, and other culinary herbs, together with various kinds of gourds. The Indian tortoises seemed most partial to the latter: grass was also freely eaten. Messrs. Dumeril and Bibron state, that in the Botanical Garden of Toulon, a large Indian tortoise existed, which was observed to give preference to a sort of gourd or calabash of extreme bitterness; but it is doubtful whether or not this taste for bitters was peculiar to the species.

The manner in which tortoises feed on leaves is very curious. They rather tear than cut off portions of the leaves on which they regale themselves; and in order to keep the vegetable steadily fixed, they place their fore feet upon it, and so press it to the ground; and when they have seized a portion between the mandibles, they separate it by drawing the head rapidly backwards. In like manner, when burrowing, they use their limbs with considerable address, scraping up the earth with their fore feet, and then shovelling it behind them with the posterior pair: in both instances, however, the action is slow and deliberate.

Of one genus * we take one instance:—

THE EUROPEAN TORTOISE.†

This species, often carried about in London by Italians for sale, is abundant in Greece, Italy, and the larger islands of the Mediterranean. Its favourite abodes are sandy lands, covered with brushwood; it feeds on herbage, roots, slugs, and earthworms; and it passes the winter in a torpid state.

The European Tortoise is plainly covered. The plates of the carapace are of a yellowish green with stains of black and yellow; the medium line of the plastron, and its lateral margins, are also of a yellowish green; the rest is black. The tip of the muzzle is brownish gray; the rest of the head is of

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* Testudo.

† T. Græca.

a greenish, or dirt tint; as are also the neck, limbs, and tail; the nail at the extremity of the latter is black. The iris is brown, encircled with a very narrow whitish line. This species seldom exceeds a foot in length.

Like most reptiles, these creatures enjoy the rays of the sun. M. Bibron says, that in Sicily, where they are very common, it was always during the hottest part of the day that he met with them basking on the sides of the road, and often found their shell so heated, that he could not with comfort apply his hand to it. He adds, that he has often seen two males engaged in most desperate conflicts; they bite each other severely, especially about the neck; but the great aim is to turn each other over on the back: and when one of the party thus puts his rival *hors de combat*, he hobbles away in triumph, leaving his vanquished adversary to a long struggle before reinstating himself on his legs.

Towards the middle of the summer, the females deposit their eggs, to the number of eight or twelve, in a little excavation, well exposed to the sun: the eggs are white, spherical, and of about the size of gall-nuts; these they carefully cover with earth, and leave to be hatched by the heat. The young appear about the beginning of autumn.

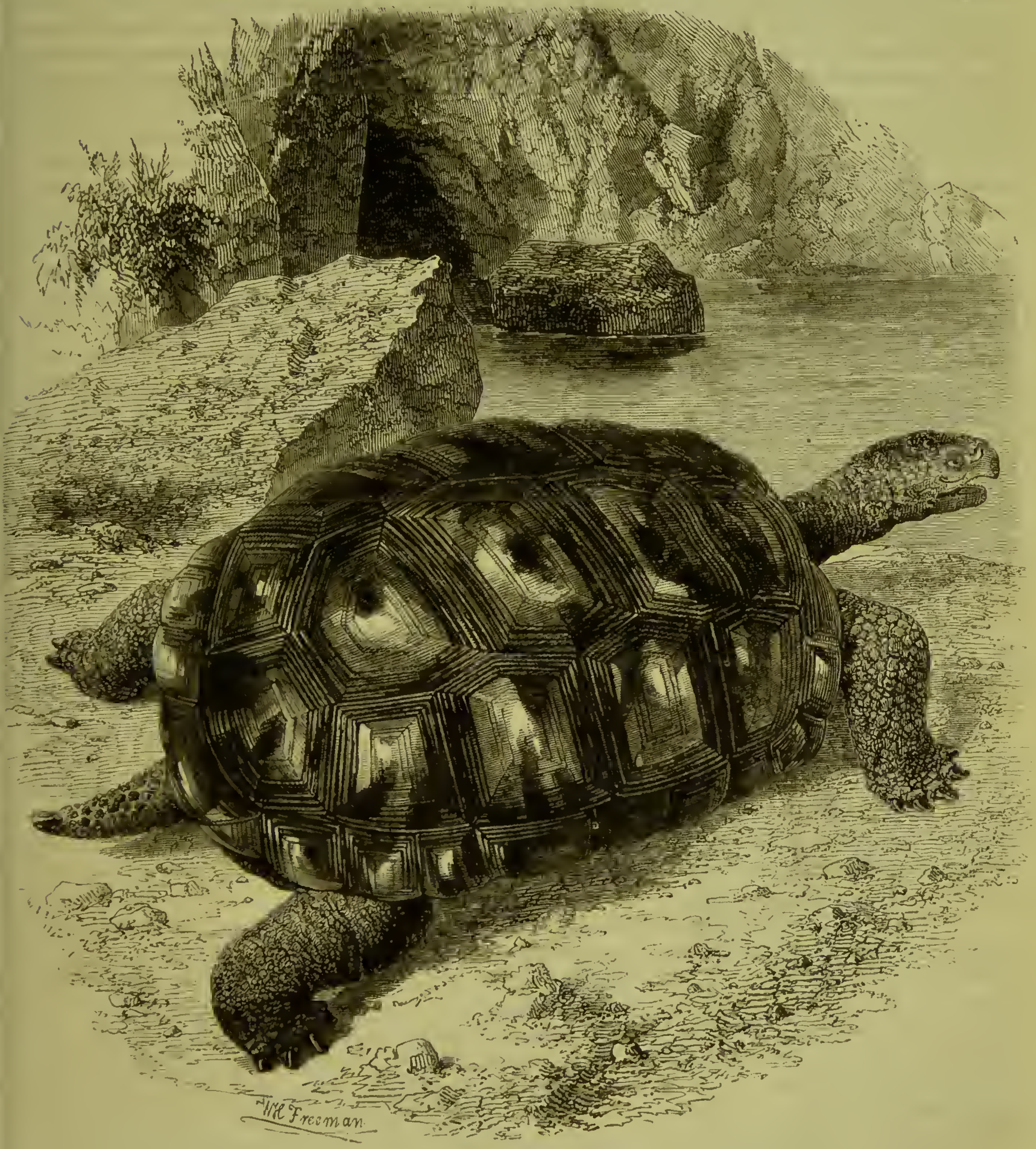
We know not why the flesh of the vegetable-feeding tortoises should not be adopted, as well as that of the green turtle, among the various articles which are in request for the table. There is much in habit and association of ideas; and though persons who would not refuse turtle might turn from tortoise with disgust, they may rest assured that, in Sicily and Italy, these land tortoises are sold in the markets, principally for being made into soup, which is more esteemed than the flesh prepared in any other way.

We do not know whether the tortoise described in so lively a manner by Gilbert White, and to which we have already alluded, belonged to the present species: probably it did, or to one very nearly allied. In a letter respecting it, to the Hon. Daines Barrington, Mr. White says:—"On the first of November, I remarked that the old tortoise, formerly mentioned, began first to dig the ground in order to the forming its hybernaculum, which it had fixed just beside a great turf of hepaticas. It scrapes out the ground with its fore-feet, and throws it up over its back with its hind; but the motion of its legs is ridiculously slow, little exceeding that of the hour hand of a clock. Nothing can be more assiduous than this creature night and day, in scooping the earth and forcing its great body into the cavity; but as the noons of that season proved unusually warm and sunny, it was continually interrupted, and called forth by the heat in the middle of the day; and though I continued there till the 13th of November, yet the work remained unfinished. Harsher weather and frosty mornings would have quickened its operations. No part of its behaviour ever struck me more, than the extreme timidity it always expresses with regard to rain; for, though it has a shell that would secure it against the wheel of a loaded cart, yet does it discover as much solicitude about rain as a lady dressed in all her best attire, shuffling away on the first sprinklings, and running its head up in a corner. If attended to, it becomes an excellent weather-glass; for, as sure as it walks elate, and, as it were, on tiptoe, feeding with great earnestness in a morning, so sure will it rain before night. It is totally a diurnal animal, and never pretends to stir after it becomes dark. When first awakened it eats nothing, nor again in the autumn before it retires; through the height of summer it eats voraciously, devouring all the food that comes in its way. I was much taken with its sagacity in discerning those that do it kind offices; for, as soon as the good old lady comes in sight, who has waited on it for more than thirty years, it hobbles towards its benefactress with awkward celerity, but remains inattentive to strangers. Thus, not only the ox knoweth his owner, and the ass his master's crib, but the most abject reptile and torpid of beings distinguishes the hand that feeds it, and is touched with the feelings of gratitude."

In a subsequent letter respecting the same animal, Mr. White says:—"Because we call this creature an abject reptile, we are too apt to undervalue his abilities, and depreciate his powers of instinct. Yet he is, as Mr. Pope says of his bird,

"'Much too wise to walk into a well,'

and has so much discernment as not to fall down an haha, but to stop and withdraw from the brink with the readiest precaution. Though he loves warm weather, he avoids the hot sun; because his thick shell, when once heated, would, as the poet says of the armour, 'scald with safety.' He, therefore, spends the sultry hours under the umbrella of a large cabbage leaf, or amidst the waving forests of an asparagus bed. But, as he avoids the heat in summer, so in the decline of the year, he improves the faint autumnal beams, by getting within the reflection of a fruit wall; and though he never has read that planes inclining to the horizon receive a greater share of warmth, he inclines his shell by tilting it against the wall, to collect and admit every feeble ray. Pitiable seems the condition of this poor, embarrassed reptile: to be cased in a suit of ponderous armour which he cannot lay aside; to be imprisoned, as it were, within his own shell, must preclude, we should suppose, all activity and disposition for enterprise. Yet there is a season of the year, usually the beginning of June, when his exertions are remarkable. He then walks on tiptoe, and is stirring by five in the morning,



THE ELEPHANTINE TORTOISE.

and, traversing the garden, explores every wicket and interstice in the fences, through which he will escape, if possible; and often has eluded the care of the gardener, and wandered to some distant field."

"Among Lycian reptiles," says Professor E. Forbes, "this tortoise is the most conspicuous and abundant. The numbers of these animals straying about the plains, and brousing on the fresh herbage in spring, astonishes the traveller. In April they commence love-making. Before we were aware of the cause, we were often surprised, when wandering among ruins and waste places, at hearing a noise, as if some invisible geologist was busily occupied close by, trimming his specimens. A search in the direction of the noise discovered the hammer, in the shape of a gentleman tortoise, who, not being gifted with vocal powers, endeavoured to express the warmth of his affection by rattling his shell against her side. The ardour of the tortoise is celebrated by Ælian. In ditches and stagnant waters the Fresh-water Tortoise* is equally plentiful. In fine weather, long rows of them may be seen sunning themselves on the banks; whence, on being alarmed, they would waddle and plunge with great rapidity into the water, apparently always following a leader, who made the first plunge from one end of the row."

Pausanias mentions a land tortoise in the woods of Arcadia, whose shell was used to make lyres.

THE ELEPHANTINE TORTOISE.†

THE visitors of the Gardens of the Zoological Society have often looked on ponderous tortoises, feeding at their ease, and utterly indifferent to any multitude of observers. Such creatures used to bear the name of the Indian tortoise,‡ but erroneously, for they are natives of the Seychelles Isles, and also of those of Cornoro, in the Mozambique Channel. Many years ago, one of them was presented to the Society by Lieut.-General Sir Charles Colville, late Governor of the Mauritius. It was one of those which were brought from the Seychelles Islands to the Mauritius, in 1766, and was believed to have remained unchanged in size and appearance, though it had been there sixty-seven years.

Of the habits of this tortoise in its native islands little is known; but, from its proximity to the equator, it is supposed that it does not burrow, or only retires for a short period. Those in this country were never observed to burrow; but were always taken under cover, and buried beneath straw, there to remain during the winter, which they passed in a torpid condition. Their existence, in such circumstances, is, however, very precarious, and many have died during the winter, or at the commencement of spring.

THE GREAT TORTOISE.

DARWIN ("Voyages of the Adventure and Beagle") gives the following admirable account of the Great Tortoise of the Galapagos Islands, which he terms *T. Indicus*, and respecting which Dampier says, "The land turtles are here so numerous, that five or six hundred men might subsist on them for several months, without any other sort of provision. They are so extraordinarily large and fat, and so sweet, that no pullet eats more pleasantly."

"These animals," observes Mr. Darwin, "are found, I believe, in all the islands of the Galapagos archipelago, certainly in the greater number. They frequent, in preference, the high, damp parts, but likewise inhabit the lower and arid districts. Some individuals grow to an immense size. Mr. Lawson, an Englishman, who had, at the time of our visit, charge of the colony, told us that he had seen several so large, that it required six or eight men to lift them from the ground, and that some had afforded as much as two hundred pounds of meat. The old males are the largest, the females rarely growing to so great a size. The male can readily be distinguished from the female by the greater length of its tail.

"The tortoises which live on those islands where there is no water, or in the lower and arid parts of the other islands, chiefly feed on the succulent cactus. Those which frequent the higher and damp regions, eat the leaves of various trees, a kind of berry called guayavita, which is acid and austere, and likewise a pale green filamentous lichen, that hangs in tresses from the boughs of the trees.

"The tortoise is very fond of water, drinking large quantities, and wallowing in the mud. The larger islands alone possess springs, and these are always situated towards the central parts, and at a considerable elevation. The tortoises, therefore, which frequent the lower districts, when thirsty are obliged to travel from a long distance. Hence broad and well-beaten paths radiate off in every direction from the wells, even down to the sea-coast; and the Spaniards, by following them up, first discovered the watering-places. When I landed at Chatham Island, I could not imagine what animal travelled so methodically along the well-chosen tracks.

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* Emys caspica.

† Testudo elephantina.

‡ T. Indica.

"Near the springs it was a curious spectacle to behold many of these great monsters; one set eagerly travelling onwards with outstretched necks, and another set returning after having drunk their fill.

"When the tortoise arrives at the spring, quite regardless of any spectator, it buries its head in the water, above its eyes, and greedily swallows great mouthfuls, at the rate of about ten in a minute, The inhabitants say each animal stays three or four days in the neighbourhood of the water, and then returns to the lower country; but they differed in their accounts respecting the frequency of their visits. The animal, probably, regulates them according to the nature of the food which it has consumed. It is, however, certain that tortoises can subsist even on those islands where there is no other water than what falls during the few rainy days in the year.

"The tortoises, when moving towards any definite point, travel by night and day, and arrive at their journey's end much sooner than would be expected. The inhabitants, from observations on marked individuals, consider that they can move a distance of about eight miles in two or three days. One large tortoise, which I watched, I found walked at the rate of sixty yards in ten minutes; that is, three hundred and sixty in the hour; or four miles a day, allowing also a little time to eat on the road.

"During the breeding season, when the male and female are together, the male utters a hoarse roar or bellowing, which, it is said, can be heard at a distance of more than a hundred yards. The female never uses her voice, and the male only at such times. They were at this season (October) laying their eggs. The female, where the soil is sandy, deposits them together, and covers them up with sand; but where the ground is rocky, she drops them indiscriminately in any hollow. Mr. Bynoe found seven placed in a line in a fissure. The egg is white and spherical: one which I measured was seven inches and three-eighths in circumference.

"The young, as soon as they are hatched, fall a prey in great numbers to a buzzard with the habits of the Caracara vulture. The old ones seem generally to die from accidents, as fròm falling down precipices: at least, several of the inhabitants told me they had never found one dead without some such apparent cause.

"The inhabitants believe that these animals are absolutely deaf; certainly they do not overhear a person walking close behind them. I was always amused when overtaking one of these great monsters, as it was quietly pacing along, to see how suddenly the instant I paused, it would draw in its head and legs, and uttering a deep hiss, fall to the ground with a heavy sound, as if struck dead. I frequently got on their backs, and then upon giving a few raps on the hinder part of the shell, they would rise up, and walk away; but I found it very difficult to keep my balance.

"The flesh of this animal is largely employed, both fresh and salted; and a beautifully clear oil is prepared from the fat. When a tortoise is caught, the man makes a slit in the skin, near its tail, so as to see inside its body whether the fat, under the dorsal plate, is thick. If it is not, the animal is liberated; and is said to recover soon from this strange operation.

"In order to secure the tortoises, it is not sufficient to turn them, like turtles; for they are often able to regain their upright position." While staying in the upper district of James's island, where a party of Spaniards were employed in catching tortoises, Mr. Darwin and his companions lived entirely on the meat of these animals. "The breastplate roasted, with the flesh attached to it," he says, "is very good, and the young tortoises make excellent soup; but otherwise, the meat to my taste is very indifferent."

MARSH TORTOISES.*

All these species inhabit marshy places, ponds, lakes, and small rivers; and hence to such circumstances their structure is adapted. The toes, for instance, instead of being completely buried, are apparent externally, and movable, but united to each other by an intervening web; thus adapting them to the land or the water—on the one they can walk, in the other they can swim. The osseous box in which the marsh tortoise dwells is also less thick and strong than in the land tortoise. Long after the animals are hatched, the spaces between the ribs, and the intervals which separate the parts of which the plastron is composed, are in a cartilaginous state, and yield to the pressure of the fingers.

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* Elodians.

The general figure of the covering of the marsh tortoise is oval, but mostly the carapace is broader behind than before. Almost all these creatures are capable of withdrawing and concealing their limbs and head within the carapace and plastron; and in one genus,* by means of the two movable portions of the latter, the animals can completely shut themselves up. The tail generally extends beyond the margin of the carapace as far as the feet when they are stretched back, but sometimes it is very short. The neck is mostly of considerable length.

The movements of the marsh tortoises, so far from being slow and laboured, are prompt and comparatively quick, and they swim with considerable address. They are carnivorous animals, preying on frogs, insects, worms, and small fishes. We take from the numerous genera and species one specimen.

THE ALLIGATOR TORTOISE.†

THIS creature, as its name denotes, makes an approach to the alligators. Its strong, hooked mandibles, its powerful limbs, its claws, which resemble those of an eagle, its depressed body, and long tail, ridged above with elevated scales, accord with its character, as one of the most savage and destructive of its race. It is a native of Carolina and the warmer districts of North America, diversified by morasses, lakes, and rivers. It preys on fish, frogs, small aquatic animals, and birds.

The strength of its jaws is surprising. Mr. Bell saw an alligator tortoise snap at once asunder a stick half an inch in diameter. Nor is it safe to approach one of these creatures, as they are extremely vicious, and will snap at the hands of a person who approaches them too nearly, and even follow up the attack. The finger of a sailor was actually snapped off, when on shipboard, by one of the savage fluviatile tortoises.

RIVER TORTOISES.‡

SPECIALLY adapted to live continually in the water, these reptiles swim with great facility, by means of the extended and almost flat surface of the carapace, and especially by their feet, which are flattened, and extensively webbed. The toes, as in the marsh tortoises, are distinguishable, and armed with claws. The essential characters of the river tortoises are thus summed up by Messrs. Dumeril and Bibron: "Tortoises with a soft carapace, a flexible and cartilaginous expansion forming the circumference of a centre of bone, by which it is supported; the surface of this bone, which is nearly flat, is marked with inequalities, and is rough. The ribs are free at their ends, the head is narrow and elongated, and the nose terminates in a flexible proboscis; the jaws are cutting, and furnished externally with folds of skin resembling lips; the eyes are prominent, placed near together, and directed obliquely upwards. The plastron has its hinder portion short, but is advanced anteriorly, so as to come under the neck. It is not entirely osseous, even in the centre, and it is united to the carapace by cartilage. The tail is short and thick, the limbs robust, with large webbed feet. Of the toes, three on each foot only are provided with nails, which are nearly straight, and channelled underneath."

Pennant mentions some of these creatures which weighed seventy pounds; one which he kept three months weighed twenty pounds; its buckler was twenty inches in length, and the neck measured thirteen inches and a half. They swim with much ease, both on the surface and at mid-water. The lower part of the body is generally pale white, rosy, or bluish; but their upper parts vary in their tints, which are most frequently brown or gray, with irregular marbled, dotted, or ocellated spots. Straight or sinuous brown, black, or yellow lines are disposed symmetrically on the right and left, principally on the lateral parts of the neck, and on the limbs.

During the nights, and when they believe themselves to be safe, the Potamians come to repose on the islets, the rocks, the fallen trunks of trees on the banks, or floating timber, whence they precipitate themselves into the water on the slightest alarm. They are very agile and voracious, and pursue, as they swim, especially young crocodiles and fishes. As their flesh is valued, they are angled for with a hook and line, baited with small fish or living animals, or with a dead bait, to which the angler gives motion; for they are said never to approach a lifeless or immovable prey. When they would seize their food, or defend themselves, they dart out their head and long neck, with the rapidity of an arrow. They bite sharply with their trenchant beak, and do not let go till the piece they have seized is taken out; the fishermen, therefore, cut off their heads generally as soon as they are caught.

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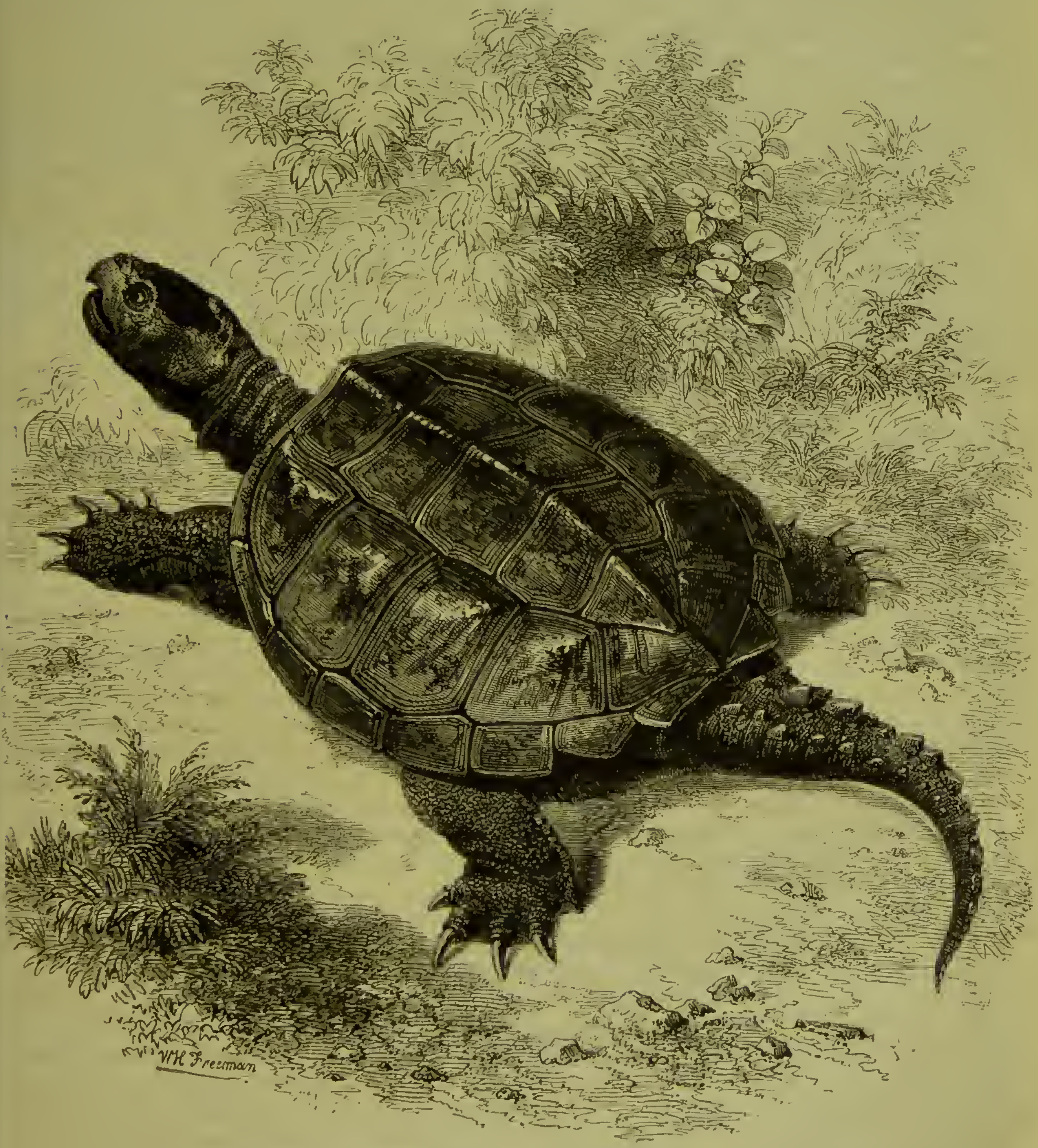
* Cistudo.

† Chelydra serpentina.

‡ Potamians.



THE ALLIGATOR TORTOISE.

The males appear to be fewer in number than the females, or, at least, they come less frequently to the banks of rivers, where the females resort to deposit their eggs in hollows, which contain from fifty to sixty; but the number varies according to the age of the females, who are less fruitful in proportion to their youth.

Allusion has been made in former volumes of this work to desirable and valuable efforts at acclimatisation; and it is worthy of remark that Professor Bell expresses his conviction that several of the fresh-water species of tortoises, both of Europe and North America, might be naturalised in the southern parts of England. "The *Terrapene Europæa*," he says, "the common lacustrine tortoise of the continent, is found in Portugal, Spain, Italy, and Greece, in France, and even in Prussia.

"These tortoises are eaten by the inhabitants of all the countries in which they are found; and they live principally upon small fish, the air-bags of which they reject. It is said that the people are wont to judge of the quality of the tortoises to be found in a lake or pond by the number of air-bags seen swimming on the surface of the water. I once placed in a small pond, in which were some of these fresh-water tortoises, six small living fish; and, on the following morning, I found the air-bags of five of them floating on the surface of the water, and the sixth fish still alive. In some parts they are fed on grains, and other nourishing food, and fattened for the table. There are also several American species of fresh-water tortoise, which will bear a greater degree of cold than that of most of our winters without perishing; and it is certainly desirable that a wholesome and agreeable food, like that afforded by some of these, should not be lost to us, if the species can be easily perpetuated and multiplied in our climate."

SEA TORTOISES, OR TURTLES.*

The enormous weight of the shell of the Turtle would be a serious impediment to the motion of this animal in the water; but, wherever there exists a supposed inconvenience, dependent on the fulfilment of one condition, we are certain to meet with a compensation in the structure of some other part, and in the mode of executing some other function. In the present instance, therefore, we find a provision made for diminishing the specific gravity in the body by the great capacity of the lungs, which, when inflated with air, nearly fill the thorax, and give great buoyancy to the whole mass.

In a species of tortoise inhabiting the coasts of the Seychelle Islands, an express provision has been made for giving buoyancy in the structure of the shell. Its under surface, instead of being gently concave, as in land tortoises, has a deep, circular concavity in the centre, above four inches in depth, which, when the animal goes into the water, retains a large volume of air, buoying up the whole mass while it remains in that element. But, throughout, it is perfectly adapted to aquatic habits. The limbs are modified so that the feet are fashioned into long, compressed oars, whose strokes are vigorous and most skilfully managed. The carapace is greatly flattened, and is covered with a coriaceous skin, the edges of which, in the greater number, remain flexible, and floating on the sides of the body.

The turtles plough the waves, dive, and ascend with as admirable address and rapidity as a bird does in the air. They seldom leave the waters of the sea, except when they go ashore to deposit their eggs. They frequently wander to great distances, and, in certain latitudes, seven or eight hundred leagues from land.

Latreille states that the troops of tortoises which habitually frequent the Galapagos islands, situated under the line, migrate to the western coast of America, distant about two hundred leagues, in order to deposit their eggs; and that the tortoises which reside near the shores of Africa resort to the Island of Ascension for the same purpose. Each species has its own period in which this important visit is performed; but it is always in the spring, or early part of the summer, and the males follow or accompany the females in their long voyage. The low, sandy shores of small desert isles, or the flat coasts of larger islands, or continents, are their usual haunts; and night is the time in which they begin their operations. The place sought is beyond the mark of the highest tides; and hence these animals have often to drag themselves to a considerable distance inland (comparatively speaking), over a long, flat, sandy beach, left dry by the ebbing tide, but to be covered by its return. The following graphic account is from the pen of M. Audubon:—

"On first nearing the shore, and mostly on fine, calm, moonlight nights, the turtle raises her head above the water, being still distant thirty or forty yards from the beach, looks around her, and attentively examines the objects on shore. Should she observe nothing likely to disturb her intended operations, she emits a loud, hissing sound, by which such of her many enemies as are unaccustomed to it are startled, and so are apt to remove to another place, although unseen by her. Should she hear any more noise, or perceive any indications of danger, she instantly sinks, and goes off to a considerable distance; but should everything be quiet, she advances slowly towards the beach, crawls over it, her head raised to the full stretch of her neck, and when she has reached a place fitted to her purpose, she gazes all around in silence. Finding all well, she proceeds to form a hole in the sand, which she effects by removing it from under her body with her hind flappers, scooping it out with so much dexterity that the sides seldom, if ever, fall in. The sand is raised alternately with each flapper, as with a large ladle, until it has accumulated behind her, when, supporting herself with her head and forepart on the ground, she, with a spring from each flapper, sends the sand around her, scattering it to the distance of several feet. In this manner the hole is dug to the depth of eighteen inches, or sometimes more than two feet. This labour I have seen performed in the short period of nine minutes. The eggs are then dropped one by one, and disposed in regular layers, to the number of one hundred and fifty, or sometimes nearly two hundred. The whole time spent in this part of the operation may be about twenty minutes. She now scrapes the loose sand back over the eggs, and so levels and smooths the surface that few persons on seeing the spot would imagine that anything had been done to it. This accomplished to her mind, she retreats to the water with all possible dispatch, leaving the hatching of the eggs to the heat of the sand. When a turtle, or loggerhead, for example, is in the act of dropping her eggs, she will not move, although one should go up to her, or even seat himself on her back; for it seems at this moment she finds it necessary to proceed at all events, and is unable to intermit her labour. The moment it is finished, however, off she starts; nor would it then be possible for one, unless he were as strong as Hercules, to turn her over and secure her."

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* Thalassians.

Tortoises generally are remarkable for tenacity of life. According to Sir E. Tennant, turtles are sold piecemeal while still alive in the market-place of Jaffna. A broad knife, from twelve to eighteen inches long, is first inserted at the left side of the turtle, and the operators, generally women, introduce one hand to scoop out the blood, which oozes freely. The blade is next passed round till the lower shell is detached, and placed on one side, when the internal organs are exposed to view in full action. As every customer chooses the part he prefers, and pays for it by weight, each of the fins is successively removed, with the selected portions of the fat and flesh; while the turtle shows by its contortions that every act of severance is productive of agony. In this state it lies for hours writhing in the sun, the heart and the head being usually the last portions selected, and till the latter is cut off, the snapping of the mouth, and the opening and closing of the eyes, prove, even when the shell is nearly divested of its contents, that life is still inherent. Redi, among other cruel experiments, removed every particle of brain from a land tortoise, in the beginning of November, yet it lived on till the beginning of May. On another occasion, he cut off the head of one of these creatures, and when, twelve days afterwards, he opened the body, he saw the heart beating, and the blood enter and leave it.

THE HAWK'S-BILL TURTLE.*

This species has the carapace large, depressed, somewhat heart-shaped, and covered with broad scales, overlaying each other. These are thick and firm, of a yellowish colour, variously stained, and marked with brown: the vertebral row are keeled, and have a raised central line.

The vertebral and costal scales of the carapace of the Hawk's-bill Turtle are thirteen in number, and instead of being united edge to edge, are imbricated—in other words, the anterior scales largely overlay the next in succession, like tiles on a house; but the part of each that overlays the next is thinner than the part adherent to the osseous framework of the carapace, and terminates in a rather sharp edge, so that the general surface is smooth. These are the valued parts of the animal. As the shell, in its original condition, is in plates, the question arises, How can various articles be made of that which appears to be cut out of a solid body? To this a satisfactory answer is given by MM. Dumeril and Bibron. They remark:—"The substance of the scale, considered as rough material, is unfortunately brittle, and liable to split; on the other hand, it possesses the most valuable properties.

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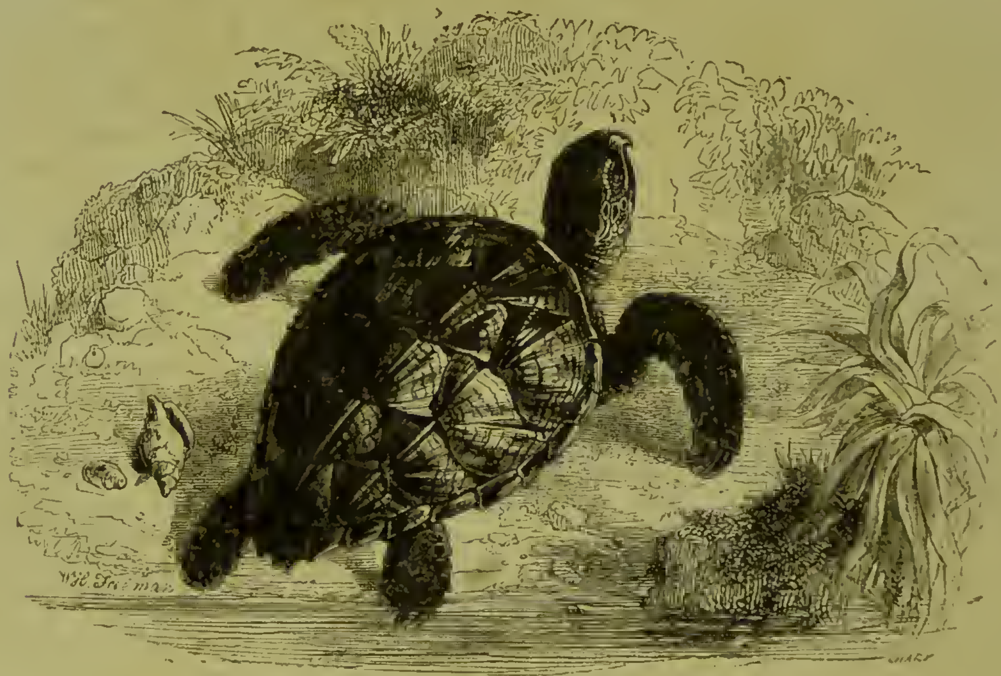
* *Chelonia imbricata.*

The fineness of its texture, its compactness, the admirable polish, and the carving which it is capable of receiving; the facility with which it may be moulded, its fragments soldered together, melted, or amalgamated by the aid of powder of the same material—these qualities give to it its value.

"The scales of the turtle in question, when detached from the carapace, are bent in different ways; their thickness, besides, is not uniform, and often it happens that they are too thin, at least throughout a great portion of their substance.

"In order to straighten them, it is sufficient to steep them in boiling water for a few minutes, and then take them out, and place them between plates of metal, or smooth blocks of hard wood, leaving them to cool; great pressure being applied at the same time. They then retain the flatness desired. They are next scraped and filed; a smooth surface being obtained with as little loss as possible. When these shells, or scales, are brought to a proper thickness and size, they may then be used separately; but they are generally submitted to a still further preparation. When, for instance, they are too thin, or when they are not sufficiently long, or broad, the following processes are employed. In order to obtain single plates of great size, two are soldered together, the thin part of one being laid upon the thin part of the other; or, as is sometimes done, the edges of each plate are delicately bevelled, and fitted together. In each case, they are then put between metallic plates; to these a certain degree of pressure is given, which, when the whole is plunged into boiling water, is increased; and by this mode, they are so intimately joined together, that the slightest trace of their union cannot be detected.



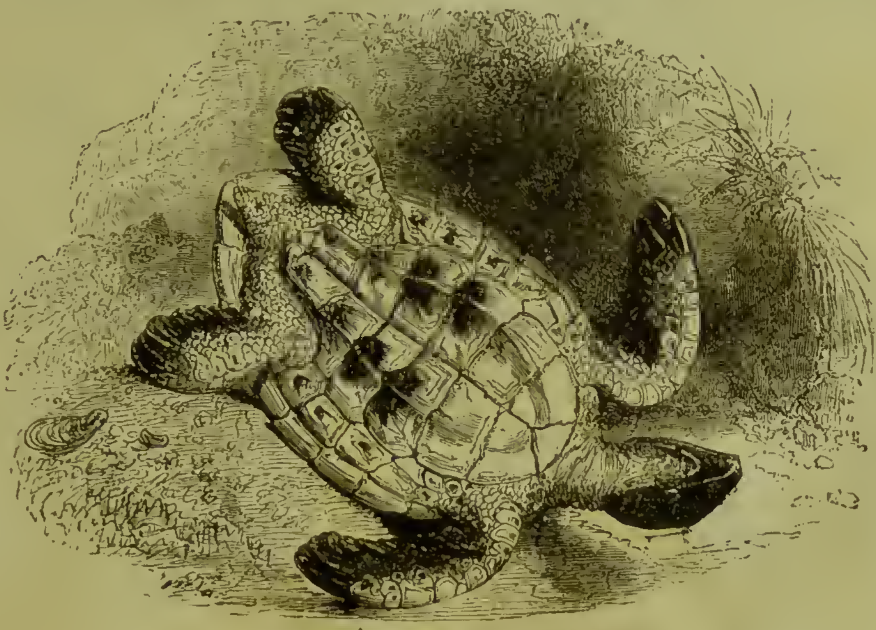
THE HAWK'S-BILL TURTLE.

"It is almost exclusively by the means of boiling water, that the effects upon tortoise-shell are obtained. The substance of the scales becomes so softened by the action of the heat, that it may be acted upon like a soft mass, or a flexible and ductile paste, which, by pressure in metallic moulds, will assume every variety of form required.

"The soldering of two pieces together is effected by means of hot pincers, which, while they compress, at the same time soften the opposed edges of each piece, and amalgamate them into one. No portion of the scales is worthless; the raspings and powder produced by the file, mixed with small fragments, are put into moulds, and subjected to the action of boiling water, and thus made into plates of the desired thickness, or into various articles, which appear cut out of a solid block."

To capture turtles, the practice is, to watch the females as they emerge from the sea to deposit their eggs, and then turn them on their backs on the high and dry sand, where they remain, absolutely helpless, till their captors fetch them at pleasure. When turtles lie floating in the sea, either to respire or to sleep, the turtle-fishers approach them quietly with a sharp harpoon, carrying a ring at the butt-end, to which a cord is attached. The harpooner strikes, and the animal dives—only, however, to be secured by the cord.

Another method is adopted at Keeling Island, of which Mr. Darwin says:—"I accompanied Captain Fitzroy to an island at the head of the lagoon: the channel was exceedingly intricate, winding through fields of delicately-branched corals. We saw several turtles, and two boats were then employed in catching them. The method is rather curious: the water is so clear and shallow, that although at first a turtle quickly dives out of sight, yet in a canoe or boat under sail, the pursuers, after no very long chase, come up to it. A man standing ready in the bows at this moment dashes through the water upon the turtle's back; then clinging with both hands by the neck, he is carried away till the animal becomes exhausted, and is secured. It was quite an interesting chase to see the boats thus doubling about, and the men dashing into the water, trying to seize their prey."



THE HAWK'S-BILL TURTLE REVERSED.

SAURIANS, OR LIZARD-LIKE REPTILES.*

In most of the Sauria, or Lizards, the body is so remarkable for its length and cylindrical figure, that, as Aristotle has observed, they resemble snakes with the addition of limbs. "Among all the reptiles," says M. Bibron, "these alone, undoubtedly, approach the nearest to mammalia, both in the variety and rapidity of their different movements, especially if we compare their progression with that of tortoises. There are, indeed, among the sauria, species which enjoy many modes of progression; for they can creep, walk, run, climb, swim, dive, and even fly.

"Nevertheless, the elongated and heavy trunk of these reptiles is not supported by the limbs without effort; they walk, in general, with constraint and slowly, for the arms and thighs are short, slender, but slightly muscular, and directed outwardly; while the elbows and knees are too angular to support with ease the superincumbent weight. Still, however, notwithstanding this conformation, so faulty in appearance (though not so in reality), they are capable of executing a great variety of movements, all bearing upon progression." The form of the tail, the length of the body, the conformation of the toes, and the shape of the claws, determine the character of these movements, and harmonise with the general habits of the animal. Thus, for example, palmated feet, or feet which have the toes united together by intervening webs, indicate aquatic habits; and the more so if, in conjunction with this structure of the feet, the tail be laterally compressed, and strongly ridged above—for, thus modified, it is capable of acting the part both of oars and rudder.

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* Sauria.

THE CROCODILE.

In the animals of the first family,* the body in its figure resembles that of a lizard : it is depressed, the back is protected by bucklers, or solid pieces of mail, of an osseous texture, with longitudinal elevated ridges, or by large plates, ridged above, and disposed in longitudinal rows ; the sides are covered with small rounded or oval plates ; and the under surface is sheathed with square, smooth scaly plates, disposed in transverse rows.

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* Crocodilidæ.

The tail is long, tapering, thick at the base, and compressed at the sides, so as to serve as a paddle. Along its upper surface ridged plates are continued from the back, at first in four rows, which at length merge into a single row of ridges. The sides of the tail are covered with square scales.

The limbs are short. The fore feet have each five distinct toes, of which the two outermost have no nails. The hind feet have four toes, of which the last has no nail; they are partially webbed. The head is flattened above, and the bones, which are rugged, are closely covered with a tough and almost horny skin. This skin is furrowed into compartments, like scales, and it also dips into the winding intervals between the rugosities of the bone, so as to render them visible.

THE CROCODILE'S FRIEND.

The teeth are numerous, thick, of unequal length, conical in figure, and hollow at the base. They are placed at a distance from each other, the intervals mutually receiving the teeth of the opposite jaw when both are closed.

The eyes are small, but bright; the pupil is linear and vertical. Besides the two external eyelids, there is a third or inner eyelid, a semi-transparent membrane,* and is designed to protect the cornea, or surface of the eye, during the animal's submersion. Beneath the throat are two large glands, opening externally by very small orifices, and producing an unctuous substance, of a strong, musky odour.

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* Membrana nictitans (see "Birds," p. 13).

The nostrils have their external apertures close together, on the upper part of the muzzle, and they are furnished with a movable valve, capable of being shut or opened. The nasal canals do not open into the cavity of the mouth, but into a post-oral cavity, divided from that of the mouth by a very curious apparatus, which must now be particularly described.

At the bottom of the mouth, between the branches of the lower jaw, there is a broad, elastic valve, stretching from side to side, and having its free edge upwards, and firmly and closely applied to a depending portion of the palate brought down to meet it. When, therefore, the mouth of the crocodile is opened, it appears as if there were no farther passage, neither windpipe nor gullet being visible.

Seizing water-fowl as they swim on the surface, pursuing fishes in the depths of the lagoon or river, or grasping in its jaws a large animal, as a pig or a dog, on the bank, the crocodile plunges beneath the water in order to drown its victim, and, were its throat open, would suffer great inconvenience. But this gular valve prevents its occurrence. As, too, the act of swallowing is momentary, at the instant it takes place the valve is drawn down by the action of the muscles of deglutition, so as to leave a free passage for the food to pass over it; which done, it returns to its former state.

Strabo tells a strange story of a crocodile he saw when he visited Egypt, about 400 years after Herodotus was there. "In this district they honour the crocodile very much, and they have a sacred one, which lives by itself in the lake, and is quite tame to the priests. He is called Suchos, and is fed with bread, and meat, and wine, which he gets from strangers who come to see him. Our host, who was a person of importance in the place, accompanied us to the lake, taking with him from table a small cake, some roasted meat, and a little cup full of some sweet liquor. We found the crocodile lying on the margin of the lake. The priests went up to him, and while some opened his mouth, another crammed into it first the cake, then the meat, and last of all, poured the drink down his throat. The crocodile, after this treat, jumped into the lake, and swam over to the other side." Souc, or Souchis, according to M. Champollion, indicates the Egyptian name of Saturn; and Suchos, most probably, was the proper name of the individual that Strabo saw at Arsinoe. Thus, Apis was the sacred bull of Memphis; that of Heliopolis was Mnevis. But, however this may be, there can be no doubt that the animal was tamed by the ancients. Plutarch relates how the crocodile can be made obedient to the human voice and hand, opening its mouth and suffering its feet to be cleaned with a towel.

According to Herodotus, crocodiles are sacred with some of the Egyptians; but not so with others, who treat them as enemies. Those who dwell about Thebes, and the lake Mœris, look on them as very sacred; and they each train up a crocodile, which is rendered quite tame. Into the ears of these crocodiles they put crystal and gold ear-rings, and adorn their fore paws with bracelets. They give them appointed and sacred food, treating them as well as possible while alive, and when dead they embalm and bury them in the sacred vaults. But the people who dwell about the city Elephantine eat them, not considering them sacred.

"The crocodile," continues the historian, "is blind in the water, but very quick-sighted on land; and because it lives for the most part in the water, its mouth is filled with leeches. All other birds and beasts avoid him, but he is at peace with the trochilus, because he receives benefit from that bird; for when the crocodile gets out of the water on land, and then opens its jaws, which it does most commonly toward the west, the trochilus enters its mouth and swallows the leeches. The crocodile is so well pleased with this service, that it never hurts the trochilus."

This singular story, related also by Pliny, is confirmed by a recent and accomplished writer, Mr. Curzon. "I will relate," he says, "a fact in natural history which I was fortunate enough to witness, and which, although it was mentioned so long ago as tho times of Herodotus, has not, I believe, been often observed since; indeed, I have never met with any traveller who has himself seen such an occurrence.

"I had always a strong predilection for crocodile-shooting, and had destroyed several of these dragons of the waters. On one occasion I saw, a long way off, a large one, twelve or fifteen feet long, lying asleep under a perpendicular bank, about ten feet high, on the margin of the river. I stopped the boat at some distance, and, noting the place as well as I could, I took a circuit inland, and came down cautiously to the top of the bank, whence, with a heavy rifle, I made sure of my ugly game. I had already cut off his head in my imagination, and was considering whether it should be stuffed with its mouth open or shut. I peeped over the bank: there he was, within ten feet of the sight of the rifle. I was on the point of firing at his eye, when I observed that he was attended by a bird called a zic-zac. It is of the plover species, of a grayish colour, and as large as a pigeon.

"The bird was walking up and down close to the crocodile's nose. I suppose I moved, for suddenly it saw me, and instead of flying away, as any respectable bird would have done, he jumped up about a foot from the ground, screamed "Zic-zac! zic-zac!" with all the powers of his voice, and dashed himself against the crocodile's face two or three times. The great beast started up, and, immediately spying his danger, made a jump into the air, and, dashing into the water with a splash which covered me with mud, he dived into the water, and disappeared. The zic-zac, to my increased admiration—proud, apparently, of having saved his friend—remained walking up and down, uttering his cry, as I thought, with an exulting voice, and standing every now and then on the tips of his toes in a conceited manner, which made me justly angry with his impertinence. After having waited in vain for some time, to see whether the crocodile would come out again, I got up from the bank where I was lying, threw a clod of earth at the zic-zac, and came back to the boat, feeling some consolation for the loss of my game in having witnessed a circumstance, the truth of which has been disputed by several writers on natural history."

It is also worthy of remark that Hamet, the intelligent attendant on the hippopotamus, when brought to this country,* said he knew the bird, which he described pretty accurately. Mr. Mitchell took him down to the museum in the Zoological Gardens, when he at once pointed out a spur-winged dotterell,† or plover, as the bird he meant. This species, it appears, is constantly found in the places where the crocodiles land, and runs about hunting for insects—small mollusca, perhaps, and such things—when the crocodiles are lying asleep. The appearance of the hunter immediately excites a noisy note from the plover; the crocodile wakes, and the natives believe that the bird is the crocodile's friend and watchman. The Sheigea Arabs call this bird *el sugáa*; the natives of Dongola call it *el' um tisaad*, which means the cousin or niece of the crocodile. Mr. Curzon's narrative leads to the inference of a much more intimate connection between the bird and the crocodile than a mere cry at the approach of danger. The spur on each of the wings of the *hoplopterus* is nearly half an inch long. One version of the story speaks of the sharp spine with which the bird is armed, and Leo places it in its head.

The structure of the crocodiles renders it difficult for them to bend their bodies sideways; whence the notion of throwing them out, when in pursuit, by doubling back. There is a story of an Englishman running before a large alligator, which came out of the lake Nicaragua, and was gaining on him fast. He would have been soon overtaken, had not some Spaniards called him to run in a circle, and baffle it by compelling it to resort to the laborious operation of turning, should it be bent on continuing the pursuit.

The crocodile is caught at the present day in Dongola for the sake of the flesh, which is regarded as a delicacy. The most favourable season is the winter, when the animal usually sleeps on sandbanks, enjoying the warmth of the sun; or the spring, after the pairing time, when the female regularly watches the sand island where she has buried her eggs; and on the south side of it—that is, to the leeward—the huntsman, therefore, digs a hole in the sand, throwing up the earth to the side he expects the crocodile to take.

In this hole he conceals himself, and, should the crocodile fail to observe him, it comes to the accustomed spot, and soon falls asleep. The huntsman then darts his harpoon with all his force at the animal; for, in order that the stroke may be successful, the iron ought to penetrate to the depth of four inches at the least, for the barb to be fixed fast. The crocodile, on being wounded, rushes into the water, and the huntsman retreats to a canoe, with which a companion hastens to his assistance; a piece of wood attached to the harpoon by a long cord swims on the water, and shows the direction in which the crocodile is moving. The huntsmen, pulling by this rope, drag the crocodile to the surface of the water, where it is pierced by a second harpoon.

The iron part of the harpoon is a span long, and formed towards the point like a penknife, being sharp at the end, and on one edge. Beyond this edge there is a strong barb, while on the back of the blade a piece projects, to which the rope is fastened. This iron head is affixed to a shaft of wood, eight feet in length. The skill of the harpooner consists in giving the weapon sufficient impulse to pierce through the coat of mail which protects the crocodile. When the crocodile is struck, it lashes violently with its tail, and endeavours to bite the rope asunder. To prevent this, the rope is made of about thirty separate thin lines, not twisted, but simply placed together, and bound at intervals of every two feet. The thin lines get between the teeth, or become entangled round them. It frequently happens that the harpoons, by the pulling of the men, break out of the animal's body, and it escapes.

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* "Cassell's Natural History," vol. ii., pp. 243–248.

† Hoplopterus spinosus.

"If I had not seen the fact with my own eyes," says Dr. Küppell, "I could hardly have believed that two men could draw out of the water a crocodile fourteen feet long, fasten his muzzle, tie his legs over his back, and finally dispatch him, by plunging a sharp instrument into his neck, so as to divide the spinal chord."

In some of the rivers of Africa the negroes are bold enough, and, indeed, skilful enough, to combat the crocodile in his own element, and, armed only with a sharp dagger, dive beneath him, and plunge the weapon in his belly. It often happens, however, that the combat is fatal to the man, and frequently his only chance of escape is to force his dagger, or, if this be lost, his thumbs, into the animal's eyes with all his might, so as to produce great pain and blindness.

The musk-glands of the crocodile form a great part of the profit that arises from its capture. The Beberines will give as much as two dollars for them, the unguent being used as a perfume for the hair. The flesh and fat are eaten by these people, who consider them excellent, but their strong smell of musk is very offensive to others.

Of one genus* there are several species. The Caïman, with bony eyelids,† is found in Cayenne and Brazil. The Pike-nosed Caïman‡ occurs in the rivers of North America. The Spectacled Caïman,§ so called from a long ridge across the forehead, and another before each eye, is a native of Cayenne, Brazil, and Paraguay.

Its name in Brazil is Jacquare, or, Jaquareaçu. Azara states that the natives of Paraguay term it Yacaré. It is abundant there, in all the rivers, lagoons, and pools. "It is commonly said that the size attained by the yacaré is in proportion to that of the river or lake it inhabits; but it is a mistake to suppose that those inhabiting small lakes do not grow to the size of those inhabiting large sheets of water. And the reason why large individuals are not found there is because they leave these small lakes for large rivers, or large lakes, where, as they increase in size, they meet with an adequate supply of food, such as fishes and ducks, which they seize, and swallow whole.

"Although the yacaré is little dreaded, and persons swim and cross the rivers without fear, yet these animals sometimes seize upon dogs, and dive with them, and I do not doubt but that they occasionally seize upon young persons, men, and various quadrupeds; but, as it is known by experience that this is not their common practice, I am inclined to think that when such circumstances happen it is because the places where their eggs are deposited are approached very closely.

"We well know that these caïmans attack persons who approach their nests, and would certainly destroy them were not escape easy; for the yacaré has not half the swiftness of a man.

"It is reported that there are two species, one of a reddish colour, the other black; and that the former is scarce and ferocious. It will attack men who are swimming, as well as cattle and mules while crossing rivers. I have not seen this red yacaré, and I suppose the accounts to be exaggerated." The red yacaré, which Azara did not see, is, most probably, the *Alligator palpelrosus*, which is of a chestnut colour on the back, and of a light chestnut on the under parts. Young specimens are of a reddish or yellowish colour, more or less inclined to brown.

"The yacaré is not found farther south than the 32nd degree of south latitude. In its habits, it is completely aquatic; and is never found excepting in the water or on the bank. When it seeks larger sheets of water, it waits for the season of great floods, the currents of which transport it with them.

"During the night, and indeed almost always, it lies below the level of the water, with only the surface of the head exposed; but towards the middle of the day, it comes upon the bank to bask in the rays of the sun.

"The eggs of this animal are white, rough, and as large as those of a goose; they are deposited

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* Alligator. † A. palpelrosus. ‡ A. lucius. § A. sclerops.

SHOOTING ALLIGATORS

to the number of sixty, in the sand, and covered with dried grasses. The Indians esteem them as food; and also relish the white and savoury flesh of the yacaré itself, although it is dry and coarse.

"In order to take this caïman, the natives use a particular sort of dart, with which they aim at the flank, the only vulnerable part. When the dart enters, the iron head separates from the shaft, and the one being attached to the other by a long string, the shaft rises to the surface; by pulling at this, they know where the caïman lies, and then, in a canoe, attack it with lances.

"The Spaniards are accustomed to amuse themselves with firing balls at this animal, but uselessly, as they can only penetrate the eyes or flanks; and, in either case, the yacaré plunges to the bottom, and there remains. Sometimes they take a portion of the lungs of an ox, or sheep, and fix in the substance of it a piece of sharp-pointed wood, with a very long cord attached to it. They throw this bait into the water; and as soon as the yacaré seizes and swallows it, drag the animal by main force to the bank."

Another genus* is distinguished from the former by the sudden narrowness of the muzzle behind the nostrils, which produces a large notch, for the lodgment of the fourth tooth of the lower jaw, when the mouth is closed. In general, the posterior margin of the leg is furnished with a series of ridged scales; and the hind toes, especially the three outermost, are joined by webs to their point. Of this genus there are many species.

CHAMELEONS.†

Of this family there is but one genus—Chameleon. One character of these animals consists in the tongue being cylindrical, worm-like, capable of being greatly elongated, and terminating in a fleshy tubercle, lubricated with a viscid saliva. Another appears in the surface of the skin being covered with horny granules, instead of scales. A third is seen in the deep and compressed form of the body, which is surmounted by an acute dorsal ridge; a fourth, in the tail being round, tapering, and capable of grasping; and a fifth, in the parrot-like structure of the feet, which have each five toes, divided into two opposing sets—three being placed outwardly and two inwardly, connected together as far as the last joint, and armed with five sharp claws.

The head of these animals is very large; and from the shortness of the neck, it seems as if set upon the shoulders. The upper part generally presents an elevated central crust; and a ridged arch is over each orbit to the muzzle. The internal organ of hearing is entirely concealed. The mouth is very wide; the teeth are sharp, small, and three-lobed. The whole of the ball of each eye, except the pupil, is covered with skin, and forms a single circular eyelid, with a central orifice. The furrow between the ball of the eye and the edge of the orbit is very deep; and the eyelid, closely attached to the ball, moves as it moves. As each eye has an independent power of motion, the axis of one eye may be seen directed upwards or backwards, while that of the other is in a contrary direction, giving to the creature a strange and most ludicrous appearance. The chameleon was once said to live on air; but insects, slugs, and such like creatures form its food. For their seizure its tongue is especially adapted. With the exception of the fleshy tubercle forming its tip, it consists of a hollow tube, which, when withdrawn into the throat, is folded in upon itself, somewhat in the way in which a pocket telescope is shut up. When fully protruded, it reaches to a distance at least equal to the chameleon's body; and is launched forth and retracted with equal rapidity. An insect on a leaf at an apparently hopeless distance, or a drop of water on a twig, is gone so instantaneously, that the spectator is astonished. "I never knew," said an acute observer, "a chameleon I long kept miss his aim but once, and then the fly was *the other side of the glass*."

"The remote cause," says Dr. Weissenborn, "of the difference of colour in the two lateral halves of the chameleon may, in most cases, be distinctly referred to the manner in which the light acts upon the animal. The statement of Murray, that the side turned towards the light is always of a darker colour, is perfectly true. This rule holds good as well with reference to the direct and diffused light of the sun, or moon, as to artificial light. Even when the animal was moving in the walks of my garden, and happened to come near enough to the border to be shaded by the box edging, that side (so shaded) would instantly become less darkly coloured than the other. Now, as the light in these cases seldom illumines exactly one lateral half of the animal in a more powerful manner than the other, and as the middle line is constantly the line of demarcation between the two different shades of colour, we must evidently refer the different effects to two different centres; from which the nervous currents can only radiate, under such circumstances, towards the organs situated respectively on one side of the mesial line.

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* Crocodilus.

† Chamæleonidæ.

"Over these centres, without doubt, the organ of vision immediately presides; and, indeed, we ought not to wonder that the action of light has such powerful effects on the highly irritable organisation of the chameleon, considering that the eye is most highly developed. The lungs are but secondarily affected; but they are likewise more strongly excited on the darker side, which is constantly more convex than the other.

THE CHAMELEON.

"Many other circumstances may be brought forward in favour of the opinion that the nervous currents in one lateral half of the chameleon are going on independently of those in the other, and that the animal has two lateral centres of perception, sensation, and motion, besides the common one, in which must reside the faculty of concentration. Notwithstanding the strictly symmetrical structure of the chameleon, as to its two halves, the eyes move independently of each other, and convey different impressions to their respective centres of perception. The consequence is that, when the animal is agitated, its movements appear like those of two animals glued together. Each half wishes to move its own way, and there is no concordance of action. The chameleon, therefore, is not able to swim, like other animals: it is so frightened, if put into water, that the faculty of concentration is lost, and it tumbles about as if in a state of intoxication. On the other hand, when the creature is undisturbed, the eye which receives the strongest impression propagates it to the common centre, and prevails upon the other eye to follow that impression, and direct itself to the same object. The chameleon, moreover, may be asleep on one side and awake on the other. When cautiously approaching my specimen at night, with a candle, so as not to awaken the whole animal, by the shaking of the room, the eye turned towards the flame would open, and begin to move, and the corresponding side to change colour; whereas the other side would remain for several seconds longer in its torpid and unchangeable state, with its eye shut."

According to Milne Edwards, two layers of pigment exist in the skin of the chameleon, arranged in such a way as sometimes to appear blended together, while sometimes one entirely conceals the other, the animal being light or dark-coloured accordingly. The superficial pigment he states to be grayish, or yellowish white; the deeper pigment of a violet hue. "Admitting," says Dr. Weissenborn, "that there are two pigments, of a dark or pale colour, contained each in a separate system of cells, by means of which M. Milne Edwards could make the colour of a piece of skin detached from the body change, by pressing the deeper pigment towards the surface, from yellowish gray to violet red, yet these pigments must possess the faculty of changing their hues, as no mechanical mixture of two given colours could produce those various tints which the skin of the chameleon exhibits at different times, and among which I have observed the pure primary yellow, and red. By the anatomical discoveries of Milne Edwards the solution of the question has, no doubt, been greatly advanced; but there are points which must be explained before we can say that we understand the phenomenon.

"In availing myself of Milne Edwards' discoveries, so far as I think they are founded on fact, I am led by my own observations to suppose that the layer of the skin which contains the superficial or whitish pigment (exhibiting different tints under different circumstances) always determines the general colour of the animal, when it is undisturbed or torpid, in consequence of the absence of external or internal irritation. On the other hand, one or more hues, determined by the rising of the darker pigment, likewise changeable, begin to develop themselves. The change proceeds to a limit determined by the degree and manner in which the chameleon is affected, the tissue containing the darker pigment stimulated, or the tissue containing the pale pigment depressed."

THE GECKOS.

THE family standing next to the chameleons is that of the Geckos,* having characteristics which prevent their being confounded with any other group.

One part of their structure may be illustrated by a plaything of the writer's boyhood, which, simple as it was, often conveyed much instruction. It consisted of a piece of leather, about four inches in diameter, having a string with a knot at the end, passed through the centre, which, dipped in water, and pressed down with the foot on a stone, raised it at pleasure from the ground. The reason of its doing so is easily understood. The edges of the wet leather, being closely pressed, stuck so firmly to the surface of the stone, as to resist the force of the string when it was pulled upwards; the consequence was, that a hollow was formed in the middle of the leather which was destitute of air, or what is called a *vacuum.*

This effect arises from a tendency that exists in all bodies to adhere together, provided the contact of their surfaces is sufficiently perfect—a property which is termed the attraction of cohesion. Were the leather dry, it would not adhere to a rough surface, because the contact could not be rendered sufficiently perfect; but when saturated with water, the interstices of the leather are filled with that fluid, and the inequalities of the surface, which would prevent close contact, are removed. As then the central part is drawn up by the string, the hollow thus produced must necessarily be a *vacuum,* since the air cannot pass through the leather to supply it; in this state, therefore, the atmosphere presses on the exterior of the leather, and, like any other weight, prevents its rising from the stone—the pressure being equal to fifteen pounds on every square inch of surface. As, however, the atmosphere, by its pressure, ultimately forces its way through the edges of the leather, the interior becomes filled with air; it consequently balances the external weight, which had before confined it, and the stone falls to the earth.

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* Geckotidæ.

This toy of childhood—the boy's "sucker"—will serve to explain the peculiar mechanism with which the gecko tribe is provided for effecting the adhesion of the feet to the objects to which they are applied. They are, be it observed, nocturnal animals; their food consists of insects, which they obtain by waiting in ambush for them, or by giving them chase into the holes and crevices to which they retreat for refuge. In pursuing them they traverse the surface of the smoothest substances, pass over the ceilings of rooms, suspend themselves on the under side of a leaf, climb the bark of trees, penetrate the cavities and clefts of rocks, and ascend walls; accomplishing all of these extraordinary movements with the greatest facility.

THE GECKO.

Accordingly, each foot is provided with five toes; all, except the thumb, being terminated by a sharp curved claw. On the under surface of each toe are sixteen transverse slits, leading to the same number of cavities; these open forwards, and their external edge is serrated, appearing like the teeth of a small-toothed comb. All these parts, together with the cavities, are covered or lined with cuticle. Below them are large muscles, which draw down the claw; and from the tendons of these muscles arise two sets of smaller muscles, situated so as to be put on the stretch, when the former are in action. By the contractions of these muscles, the orifices of the cavities, to which they belong, are opened, and the serrated edges applied accurately to the surfaces with which the feet are in contact. Thus, as in the boy's plaything, adhesion takes place, and a vacuum is produced, which is terminated at the will of the gecko, by the admission of the air.

THE VARANS.

Of all the Saurians, next to the crocodiles, the Varans* attain to the largest dimensions; but their figure is peculiarly graceful, and their actions quick and alert. They are divisible into two groups—the land and the aquatic.

In the land varans, the tail is nearly conical; but in the aquatic it is compressed laterally, and surmounted by a ridge, formed by two series of flattened scales. The tail is a most important organ of their progression. They lash the water rapidly and powerfully, from side to side, and thus cleave the water with arrow-like rapidity. The body, in consequence of the air with which the lungs are filled, floats on the surface; the tail acting at once as a rudder and an oar.

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* Varanidæ.

The varans, when on the ground, are quick and active. The toes are large and strong, and armed with sharp claws; and they are able, if not to climb trees, to scramble up rocks and craggy precipices. The usual places of abode, of the one class, are desert plains; of the other, the borders of rivers. They are natives of Africa, India, the islands of the Indian Ocean, the Philippines, the Moluccas, &c., and of Australia. Only one appears to be known in America; it is a native of Mexico.

To one family has been given the name of Monitors,* from the supposed warning given by them of the vicinity of crocodiles. This was said to be a hissing or whistling; but the better opinion is that they obtained credit for this notion solely from the accident of their haunts, which are chiefly in the neighbourhood of the waters, and consequently bring them sometimes into company with the larger reptiles. Of this family the species are very numerous.

THE NILOTIC MONITOR.†

The head of this reptile is gray, and when young, it has concentric rows of white spots. The back of the neck has lunate cross bands. The under side of the body and head are grayish, white-spotted when young, and black cross-banded. The shield over the eyes is flat, sub-equal, and many-sided. This species appears on the monuments of the ancient Egyptians, probably from devouring the eggs of the crocodile.

It is still very common in the great river of Egypt; it is also found in the Senegal, and in the Galbar, near Sierra Leone; or, one closely allied to it, in the rivers of Southern Africa.

Sparrman says: "One of this species, of the middle size, which, together with its two young ones, I brought home with me, from Agter Bruntjeshoogte, was about two feet long in the body, and three in the tail. Having caught her by the neck, so that she could not bite me, and finding that it required some strength to hold her fast, I got a large worsted needle, and gave her several punctures with it, not only in the heart, but in every part of the cranium which was in contact with the brain. This, however, was so far from answering my purpose, which was to kill her in the most speedy and least painful manner, without mangling or mutilating her, that she seemed still to have life enough left to be able to run away. After this, my host undertook to put an end to her; and having given her several hard squeezes about the chest, and tied her feet together, hung her up by the neck in a noose, which he drew as tight as he possibly could. From this situation she was found, in the space of forty-eight hours, to have extricated herself, though she still remained near the farm; appearing, at the same time, to be almost entirely exhausted. Upon this, we tied her feet close behind her, so that with her long and sharp claws, of which she had five upon each foot, she could not damage the serpents and other animals, which I kept in a cask of brandy, and among which I put her with my own hands, holding her a long time under the surface of the liquor. Yet she was so far from being suffocated immediately, that she flounced about, and even a quarter of an hour afterwards convinced us by her motions that she had still some life remaining in her.

"This species of lizard I found to be amphibious, living in water as well as on land, and likewise that it grew to a still greater size; consequently, it appears to be an extremely long-lived animal; and, as well on account of this property as of that of not being killed without great difficulty, to have an important office assigned it, in the general economy of Nature. It was supposed, and not without foundation, by the people with whom I resided, that this creature might easily be made tame, and that it was not, in the least, of a venomous nature."

Dr. Smith describes a varan‡ which he discovered during his late African expedition. "Though no specimens of this species," he observes, "were obtained south of Lattakoo, yet there is reason to believe that it occurs occasionally within the limits of the Cape colony. It is, in all probability, the animal called Das Adder, by the Cape colonists; and which is much dreaded, under the idea of its being very venomous. It is usually discovered in rocky places, or on low, stony hills; and when surprised, seeks concealment in the chinks of the former, or in the irregular cavities of the latter. When any inequalities exist upon the surface of the rocks or stones, it clasps them so firmly with its toes, that it becomes a task of no small difficulty to dislodge it. Under such circumstances, the strength of no one man is able to withdraw a full-grown individual; and I have seen two persons required to pull a specimen out of a position it attained, even by the assistance of a rope round one of its hinder legs. The moment it was dislodged, it flew with fury at its enemies, who by flight only saved themselves from being bitten."

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* Monitoridæ.

† Monitor Niloticus.

‡ Varans albogularis.

Of another genus,* the head is small; the nostril in a scale, rather tubular on the side of the face-ridge; the tympanum of the ear is visible, opaque, and white. These creatures live on trees, walking with agility with their wings folded on their sides; but they expand them and use them as a parachute when they throw themselves from the tops of trees. The nape is crested, and the scales unequal; some larger, keeled.

LIZARDS.†

To one family of this order every lizard indigenous to the British Islands is referable, and, consequently, these creatures are better understood than many others.

The body is rounded and elongated. The skin is scaly, the scales varying in form, but there is no dorsal ridge, though sometimes a ridge along the tail. The throat is not dilated into a dewlap, but a distinct row of large, broad scales, with one or more transverse folds, dividing between them and the general sealing of the under parts, forms a throat collar which is very distinct. The abdomen is protected by scales, always much larger than those of the back, and either oblong or rounded. The thighs are mostly furnished with a line of pores.

The head is pyramidal, flattened above, and covered with plates. The tympanic membrane is distinct. There is usually a nictitating membrane for the defence of the eye, in addition to the ordinary eyelids. The mouth is very wide, and its edges are covered with large labial plates. The tongue is free, fleshy, slender, and bifid; it is often capable of great extension, and is frequently lodged in a basal sheath. The teeth are variable in form and structure, but are inserted into the internal edge of a common furrow, running along the sides of the maxillary bones. Sometimes there are teeth in the palate, at others the contrary.

The limbs are well-developed; the toes are four or five in number on each foot, and are armed with hooked claws. The tail, which mostly exceeds the body, is conical, terminating in a slender point, and is covered with scales, disposed in regular rings around it.

The movements of the lizards are serpentine. They assist themselves in locomotion, not exclusively by the limbs, but also, and that materially, by the body, and especially by the tail. The latter is liable to accidents, and is so brittle as to break off easily, but it is soon renewed; the renewed part, however, is clearly distinguishable, by a difference of colouring from the rest. The vertebræ, instead of being hard and bony, are in a state of cartilage.

A very limited number of these animals, however, and those of small size, inhabit our island, and the parallel and more northern countries of the adjacent continent. But as we pass southwards, the number of species increases, and among them some occur of unexpectedly large dimensions, as the Eyed Lizard,‡ measuring sixteen or seventeen inches in length, and which is a native of Spain, Italy, and the south of France.

On arriving, however, at the borders of the intertropical latitudes, we enter on the great nurseries of the lizards. Here not merely are they thinly scattered, but they crowd their respective localities. No search for them is necessary; they obtrude themselves on our path, and haunt even the abodes of man. They swarm among the trees, lie motionless on the surface of the water, enjoying the hot rays of the sun; cover banks, walls, and crumbling ruins; and minglo their sparkling colours with those of the brilliant vegetation amidst which they nestle.

Bruce relates that the number he saw one day in the great court of the Temple of the Sun, at Balbec, amounted to many thousands. The ground, the walls, and the stones of the ruined buildings

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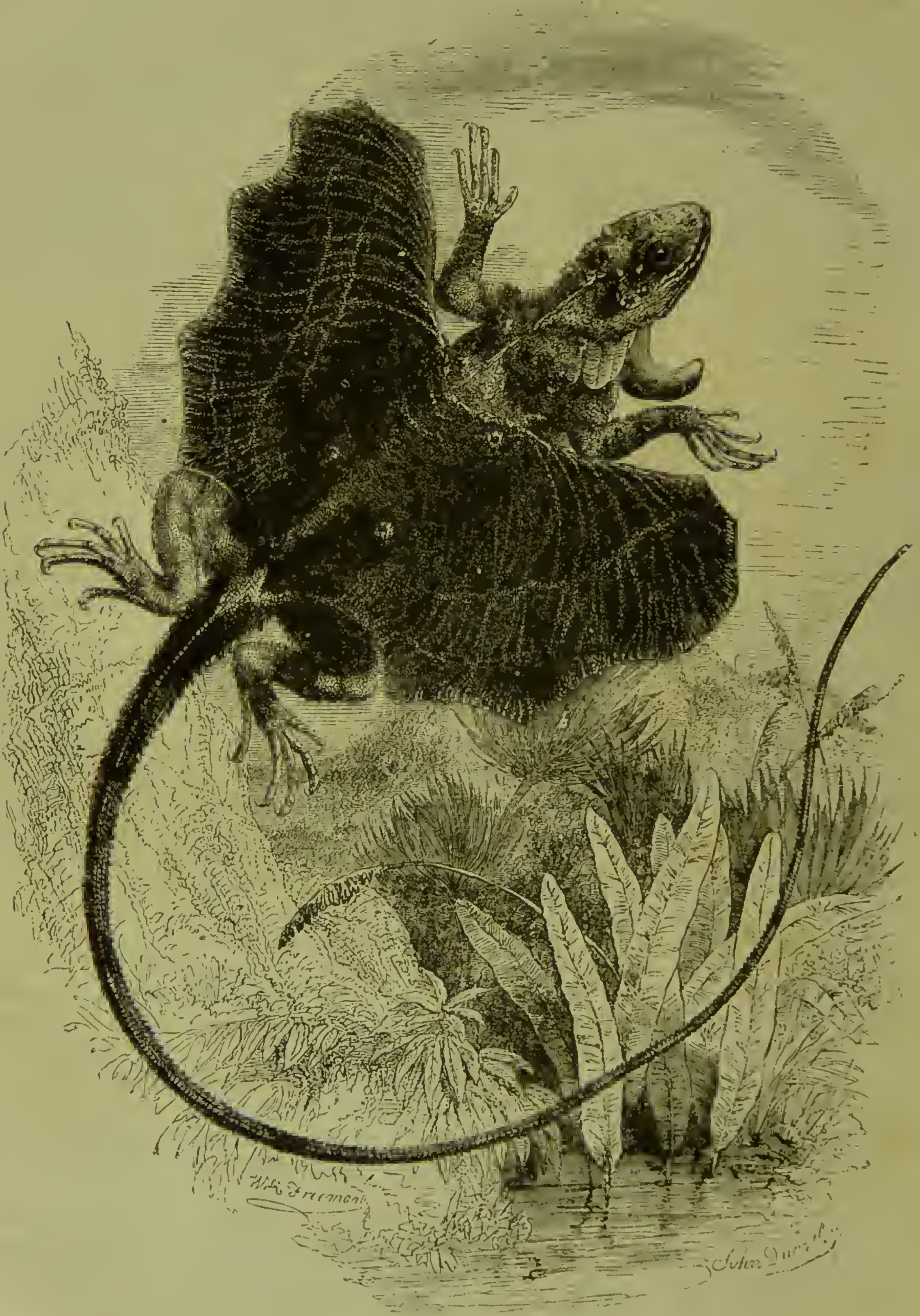
* Draconina. † Lacertinidæ. ‡ Lacerta ocellata.



THE WINGED DRAGON (*Draco volans*).

were covered by them; and the colours of which they consisted made a very extraordinary appearance, glittering under the sun in which they lay basking and sleeping. The description thus given is no less applicable to similar places throughout the warmest latitudes than it is to the Temple of the Sun.

In most of the lizards the body is so remarkable for its length and cylindrical figure, that, as Aristotle observed, " they resemble snakes, with the addition of limbs." The skin is protected either by horny plates, by scales of various sizes and figures, or by granulations. Generally, the limbs are four, and the toes are armed with claws, but the body always terminates in a tail, which is frequently of considerable length. The eyes are protected by eyelids, with certain exceptions; and, in most cases, a tympanic membrane covers the orifice leading to the internal organs of hearing. There is a sternum, or breast-bone, and the ribs are distinct and movable. The jaws are armed with teeth, and the bones of which they consist are firmly united together.

THE VARAN OF THE NILE. (*See page* 30.)

The elongated and heavy trunk of the lizards is not supported by the limbs without effort. Generally they walk with constraint, and slowly; for the arms and thighs are short, slender, but slightly muscular, and directed outwardly; while the elbows and knees are too angular to support with ease the superincumbent weight. They are capable, however, of executing a great variety of movements, all bearing on progression. The form of the tail, the length of the body, the conformation of the toes, and the shape of the claws, determine their character, and always harmonise with the peculiar habits of the animal.

One family* is very extensive, which Wagler thus characterises: "A very large, thin dewlap under the neck; cephalic plates, polygonal, unequal in diameter, flat, or carinated; a double row of small palatal teeth; maxillary teeth, with their edges firmly dentilated; a crest on the back and tail; toes long and unequal; a single row of femoral pores; tail very long, slender, compressed—covered with small, equal, imbricated, carinated scales."

THE RED-THROATED LIZARD.†

THIS beautiful reptile is a native of the West India Islands. Its colour is green, more or less tinged with blue. There is no dorsal crest; the tail is large, strong, and slightly depressed at its base—its remainder being slender, and slightly compressed; a minute dentated ridge runs along its upper surface. The scales on the back and sides are very small, somewhat oval and granular, and of equal size; they are not imbricated. Those on the under parts are smooth, and overlay each other. When irritated, the throat swells, and becomes as red as a cherry.

"Some years since," says Mr. Bell, "I had two living specimens of the beautiful little green Anolis of the West Indies. I was in the habit of feeding them with flies, and other insects; and having one day placed in the cage with them a very large garden spider,‡ one of the lizards darted at it, but only seized it by the leg. The spider instantly ran round the creature's mouth, weaving a very thick web round both the jaws, and then gave it a severe bite on the lip, just as this spider usually does with any large insect which it has taken. The lizard was greatly distressed, and I removed the spider, and rubbed off the web, the confinement of which appeared to give it great annoyance; but in a few days it died, though previously in as perfect health as its companion, which lived for a long time afterwards."

THE AMBLYRHYNCHUS CRISTATUS.

"THIS lizard," says Mr. Darwin, "is extremely common in all the islands of the Galapagos archipelago. It lives exclusively on the rocky beaches, and is never found—at least, I never saw one—even ten yards on shore. It is a hideous-looking creature, of a dirty black colour, stupid and sluggish in its movements. The usual length of a full-grown one is about a yard, but there are some even four feet long. I have seen a large one which weighed twenty pounds.

"On the island of Albemarle they seem to grow to a greater size than on any other. These lizards were occasionally seen some hundred yards from the shore, swimming about; and Captain Collnett, in his 'Voyage,' says they go out to sea in shoals to fish. With respect to the object, I believe he is mistaken; but the fact, stated on such good authority, cannot be doubted.

"When in the water, the animal swims with perfect ease and quickness, by a serpentine movement of its body, and flattened tail; the legs, during this time, being motionless, and closely collapsed on its sides. A seaman on board sank one, with a heavy weight attached to it, thinking thus to kill it directly; but when, an hour afterwards, he drew up the line, the lizard was quite active. Their limbs and strong claws are admirably adapted for crawling over the rugged and fissured masses of lava, which everywhere form the coast. In such situations a group of six or seven of these hideous reptiles may oftentimes be seen on the black rocks, a few feet above the surf, basking in the sun, with outstretched legs.

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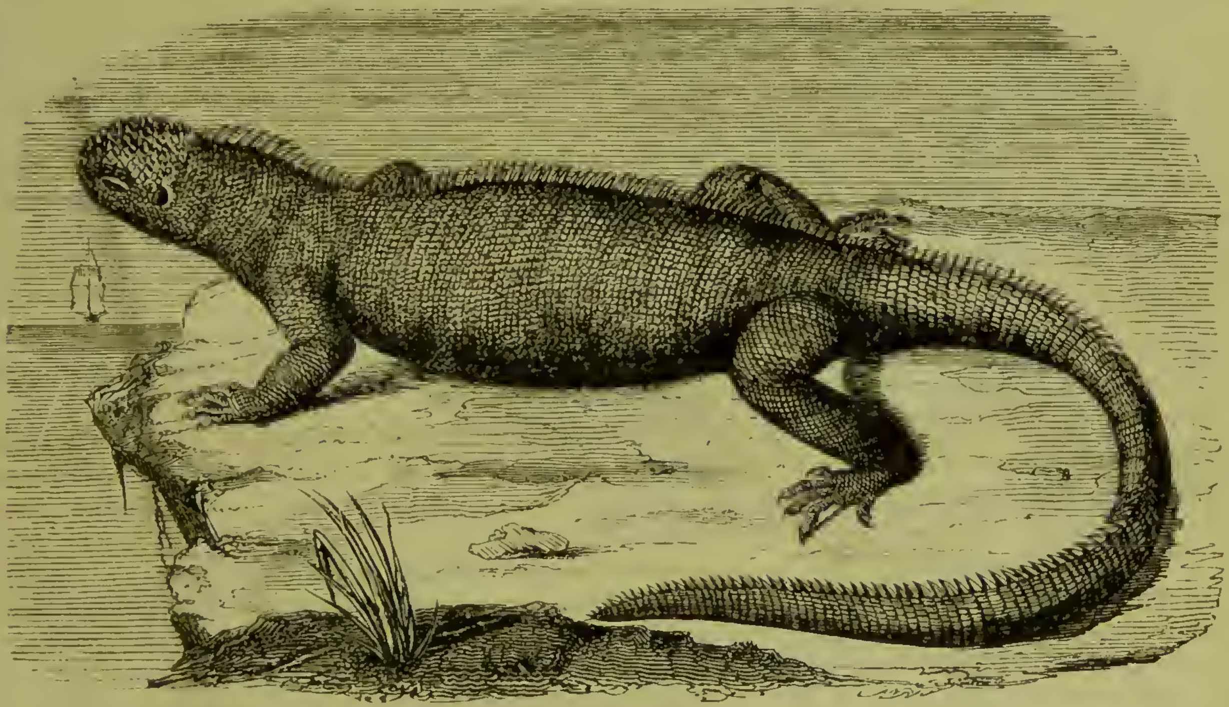
* Iguanidæ.

† Anolis chloro-cyanus: Bibron.

‡ Epeira diadema.

" I opened the stomach of several, and in each case found it largely distended with minced sea-weed, of that kind which grows in thin foliaceous expansions, of a bright green or dull red colour. I have not observed this sea-weed in any quantity on the tidal rocks, and I have reason to believe it grows at the bottom of the sea, at some little distance from the coast. If such is the case, the object of these animals going out to sea is explained. The stomach contained nothing but the sea-weed. Mr. Bynoe, however, found a piece of a crab in one; but this might have got in accidentally, in the same manner as I have seen a caterpillar, in the midst of some lichen, in the paunch of a tortoise. The intestines were large, as in other herbivorous animals.

" The nature of this lizard's food, as well as the structure of its tail, and the certain fact of its having been seen voluntarily swimming out at sea, absolutely prove its aquatic habits; yet there is, in this respect, one strange anomaly, that, when frightened, it will not enter the water.



THE AMBLYRHYNCHUS CRISTATUS.

" From this cause it is easy to drive these lizards down to any little point overhanging the sea, where they will sooner allow a person to catch hold of their tail than jump into the water. They do not seem to have any notion of biting; but when much frightened, they squirt a drop of fluid from each nostril.

" One day I carried one to a deep pool left by the retiring tide, and threw it in several times, as far as I was able. It invariably returned in a direct line to where I stood. It swam near the bottom, with a very graceful and rapid movement, and occasionally aided itself, over the uneven ground, with its feet. As soon as it arrived near the margin, it either tried to conceal itself in the tufts of sea-weed, or entered some crevice. As soon as it thought the danger was past, it crawled out on the dry rocks, and shuffled away as quickly as it could. I several times caught this same lizard, by driving it down to a point; and though possessed of such perfect powers of diving and swimming, nothing would induce it to enter the water; and, as often as I threw it in, it returned in the manner above described.

" Perhaps this singular piece of apparent stupidity may be accounted for by this circumstance, that this reptile has no enemy whatever on shore; whereas, at sea, it must often fall a prey to the numerous sharks. Hence, probably, urged by a fixed and hereditary instinct that the shore is its place of safety, whatever the emergency may be, it there takes refuge.

" During our visit in October, I saw extremely few small individuals of this species, and none, I should think, under a year old. From this circumstance, it seems probable that the breeding season had not commenced. I asked several of the inhabitants if they knew where it laid its eggs; they said that though well acquainted with the eggs of the other kind (namely, of the following species) they had not the least knowledge on this part of the history of this aquatic kind—a fact, considering how common an animal this lizard is, not a little extraordinary."

AMBLYRHYNCHUS SUBCRISTATUS.

THIS species, unlike the last, is a land lizard. Mr. Darwin says: "It is confined to the central islands of the archipelago—namely, to Albemarle, Barrington, and Indefatigable. To the southward, in Charles', Hood, and Chatham Islands, and to the northward, in Tower's, Bindloe's, and Abington, I neither saw nor heard of any.

"In the central islands, they inhabit both the higher and damp, as well as the lower and sterile parts; but in the latter, they are much the most numerous. I cannot give a more forcible proof of their numbers than by stating that when we were left at James's Island, we could not, for some time, find a spot free from their burrows on which to pitch our tent.

"These lizards, like their brothers, the sea kind, are ugly animals; and from their low facial angle, have a singularly stupid appearance. In size, perhaps, they are a little inferior to the latter, but several of them weighed between ten and fifteen pounds each. The colour of their belly, front legs, and head, excepting the crown, which is nearly white, is a dirty yellowish orange. The back is brownish red, which in the younger specimens is darker.

"In their movements, they are lazy and half torpid. When not frightened, they slowly crawl along, with their tails and bellies dragging on the ground. They often stop, and doze for a minute, with closed eyes and hind legs spread out on the parched soil.

"They inhabit burrows, which they sometimes excavate between fragments of lava, but more generally on level patches of the soft volcanic sandstone. The holes do not appear to be very deep, and they enter the ground at a small angle; so that, when walking over these lizard warrens, the soil is constantly giving way, much to the annoyance of the tired walker.

"The animal, when excavating its burrow, alternately works the opposite sides of its body. One front leg, for a short time, scratches up the soil, and throws it towards the hind foot, which is well placed, so as to heave it beyond the mouth of the hole. This side of the body being tired, the other takes up the task; and so on alternately. I watched one for a long time, till half its body was buried; I then walked up, and pulled it by the tail; at this, it was greatly astonished, and soon shuffled up to see what was the matter, and then stared me in the face, as much as to say, 'What made you pull my tail?'

"They feed by day, and do not wander far from their burrows; and if frightened, they rush to them with a most awkward gait. Except when running down hill, they cannot move very fast; which appears chiefly owing to the lateral position of their legs.

"They are not at all timorous: when attentively watching any one, they curl their tails; and, raising themselves on their front legs, nod their heads vertically with a quick movement, and try to look very fierce; but, in reality, they are not at all so: if one just stamps the ground, down go their tails, and off they shuffle, as quickly as they can. I have frequently observed small muscivorous (fly-eating) lizards, when watching anything, nod their heads precisely in the same manner; but I do not at all know for what purpose.* If this Amblyrhynchus is held, and plagued with a stick, it will bite very severely; but I caught many by the tail, and they never tried to bite me. If two are placed on the ground, and held together, they will fight and bite each other till blood is drawn.

"The individuals (and they are the greater number) which inhabit the lower country can scarcely taste a drop of water throughout the year; but they consume much of the succulent cactus, the branches of which are occasionally broken off by the wind. I have sometimes thrown a piece to two or three together, and it was amusing enough to see each trying to seize and carry it away in its mouth, like so many hungry dogs with a bone. They eat very deliberately, but do not chew their food. The little birds are aware how harmless these creatures are: I have seen one of the thick-billed finches picking at one end of a piece of cactus (which is in request among all the animals of the lower region), whilst a lizard was eating at the other; and afterwards the little bird, with the utmost indifference, hopped on the back of the reptile.

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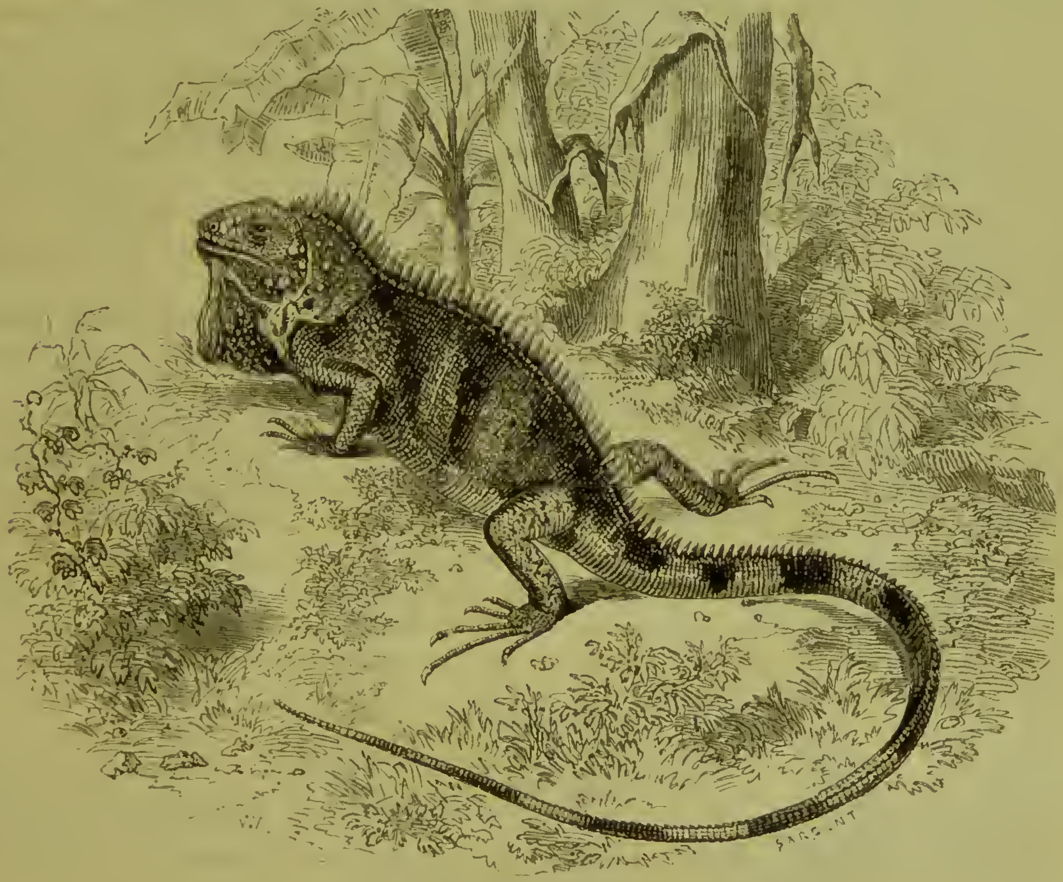
* A lizard common in Egypt (a species of Stellio) dips its head in the same way; and the Mohammedans pursue and kill it, because they say it mocks them, by this action, when they are engaged in their devotions. Such is the folly of superstition.

"I opened the stomachs of several, and found them full of vegetable fibres, and leaves of different trees, especially of a species of acacia. In the upper region, they chiefly live on the acid and astringent berries of the guayavita; under which trees I have seen these lizards and the huge tortoises feeding together. To obtain the acacia leaves, they crawl up the low, stunted trees; and it is not uncommon to see one, or a pair, quietly browsing, whilst seated on a branch several feet above the ground.



THE COMMON IGUANA.

"The meat of these animals, when cooked, is white; and by those whose stomachs rise above all prejudices, it is relished as very good food. Humboldt has remarked, that in intertropical South America all lizards which inhabit dry regions are esteemed delicacies for the table. The inhabitants say, that those tenanting the damp regions drink water; but that the others do not travel up for it from the sterile country, like the tortoises."

The eggs, which are numerous, large, and oval, are deposited by these lizards in their burrows; the inhabitants of the islands esteem them as food.

"These two species of amblyrhynchus agree," adds Mr. Darwin, "in general structure, and in many of their habits; neither have they that rapid movement so characteristic of true lacerta and iguana. They are both herbivorous, although the kind of vegetation consumed in each case is so very different."

THE COMMON IGUANA.*

This animal, often called the Guana, is found very generally throughout the warmer regions of South America and the West India Islands. It is yellowish-green below, and above of a green more or less deep, becoming sometimes bluish, and at others of a slate colour. In general, there are on the sides of the body brown stripes, or zigzags, edged with yellow; a line of the latter colour is frequently traced obliquely on the front of the shoulder. Some individuals are sprinkled with brown; others have the limbs spotted with brown on a black ground. The tail is surrounded with large brown rings, which alternate with others of green or yellow. The length seldom exceeds five inches.

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* Iguana tuberculata: Laurenti.

Catesby informs us, that many of the Bahama Islands abound with these animals, which "nestle in hollow rocks and trees; their eggs have not a hard shell, like those of alligators, but a skin only, like those of a turtle, and are esteemed good food. They lay a great number of eggs at a time in the earth, which are hatched by the sun's heat. The guanas furnish a great part of the subsistence of the inhabitants of the Bahama Islands, for which purpose they visit many of the remote kayes and islands, in their sloops, to catch them, which they do by dogs trained up for that purpose, and which are so dexterous as not often to kill them. If they do so, however, the guanas serve only for present use; if otherwise, they sew up their mouths to prevent their biting, and put them into the hold of their sloop, until they have obtained a sufficient number, which they either carry alive for sale to Carolina, or salt and barrel up for the use of their families at home. These guanas feed wholly on vegetables and fruit, especially on a particular kind of fungus growing at the roots of trees, and on the fruits of the different kinds of ananas. Their flesh is easy of digestion, delicate, and well-tasted; they are sometimes roasted, but the more common way is to boil them, taking out the fat, which is melted, and clarified, and put into a dish, into which they dip the flesh of the guana as they eat it.

"Though not amphibious, they are said to keep under water above an hour. They cannot run fast, their holes being a greater security to them than their heels. They are so impatient of cold, that they rarely appear out of their holes but when the sun shines."

Brown, in his "Natural History of Jamaica" (an island where this lizard is now, we believe, quite extinct), says that, like most of the tribe, this animal "lives a very considerable time without food, and changes its colour with the weather, or the native moisture of its place of residence. I have kept," he adds, "a grown guana about the house for more than two months. It was very fierce and ill-natured at the beginning, but after some days it grew more tame, and would, at length. pass the greatest part of the day upon the bed or couch, but always went out at night. The flesh of this creature is liked by many people, and frequently served up in fricassees at their tables, in which state it is often preferred to the best fowls. The guana may be easily tamed while young, and is both a harmless and beautiful creature in that state."

THE FRILLED LIZARD.*

THIS remarkable creature is a native of New Holland. It has an expanse of skin, in the form of two large discs; a kind of frill to the sides of the neck and throat; the edge of it is serrated, and the whole covered by small, keeled scales. The head is short, and somewhat pyramidal; there are pores on the thighs; and the tail is long. In general, the colour is yellow, with markings of a lighter tint, bordered with brown on the back. The folded frill, which has been compared to Queen Elizabeth's muff, is elevated when the lizard is excited.

THE EYED LIZARD.†

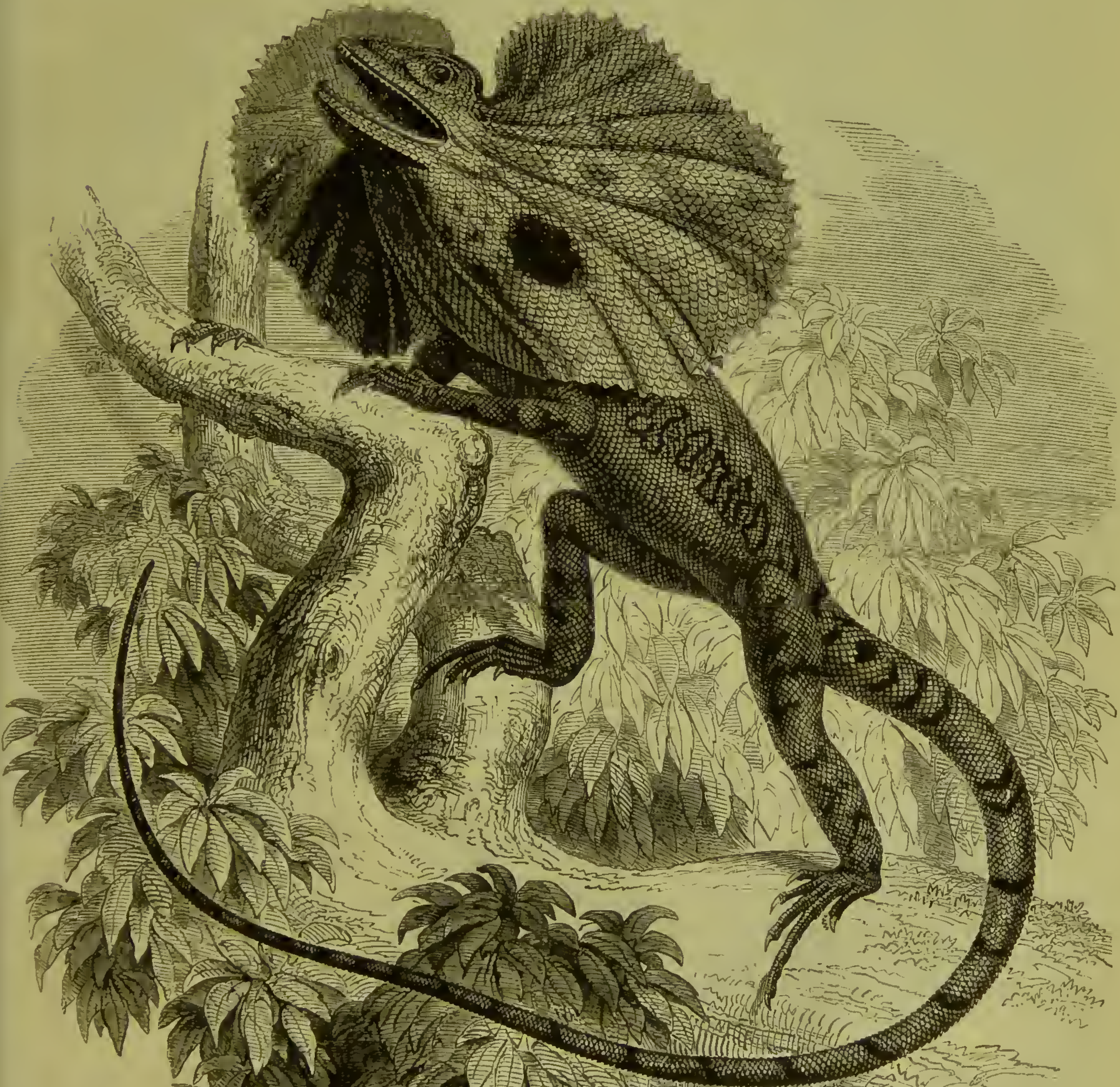
THIS beautiful lizard, which is about sixteen inches in length, is of a bright, glossy green, ornamented with round spots of gold and blue, and with rings and irregular markings of black. It is found in the south of France, in Italy, Spain, and the northern coast of Africa. It burrows, when young, in the banks of the fields, especially where the ground is sandy; but, when full grown, it excavates its retreats in layers of hard sand. Worms and insects constitute its food; and so resolute is it, that, if attacked by a dog, it will fasten on his muzzle, and suffer itself to be killed before it will let go its hold.

* Chlamydosaurus Kingii.

† Lacerta ocellata.

THE GREEN LIZARD.*

The general hue of this lizard is a beautiful metallic green, which, on the under parts, is paler, or fades into a yellow tint; but its colour is subject to considerable variation. The back and head are often minutely freckled with black, and occasionally with yellow. Sometimes the head is blue.



THE FRILLED LIZARD.

The Green Lizard is a native of France, Italy, Spain, Greece, and the neighbourhood of Algiers. It appears in Switzerland and in the island of Guernsey, but is not found in England or Ireland. Its favourite places of resort are tangled brushwood, brakes, and thickets; and it climbs the stems of bushes with great facility. It is soon rendered tame, and might be turned loose in green-houses with advantage, as it would destroy insects, which are its food. It is so beautiful and graceful a creature as often to be kept in cages.

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* Lacerta viridis.

THE SAND LIZARD.*

According to M. Bibron, this animal inhabits the plains and hills, but never the mountains, of the European continent. In England it prefers the margins of woods to large gardens and copses.

The general tint of the upper part is usually sandy brown, with obscure longitudinal marks of a darker brown, and with a series of small rounded spots down the sides, each one having a white or yellowish dot in the centre. In some the sides are tinged with green; in others, the upper parts are green, or brownish-green; and in others, of a dull, brick-red colour.

The retreat of the Sand Lizard is a burrow, varying in depth, worked out under a tangled maze of herbage, or between the roots of a tree; and, having closed the entrance with earth and dried leaves, here it remains during the winter. It does not emerge till the warm weather has returned.

Some specimens have been seen upwards of seven inches long; but the Rev. R. Sheppard adduces an instance of one which exceeded a foot, and Mr. Bell has "occasionally seen them approaching that length, measured from the nose to the extremity of the tail." This distinguished naturalist has had abundant opportunities of observing this lizard, which he states is common in the neighbourhood of Poole. "Its general abode," he observes, "is on sandy heaths, where it is frequently seen crossing the small bye paths, with considerable swiftness, although it is certainly less rapid in its movements than the smaller and more common species, the Viviparous Lizard. The transient glance which is thus obtained of it, together with its viperine appearance and colours, and the size and length of its body and tail, may easily have deceived Mr. Sheppard, who says that he has often mistaken it for the viper, when hastily passing by it. But it is also occasionally seen on the sunny sides of green banks, basking in the sun's rays, and retreating quickly on the approach of any intruder. Mr. Sheppard mentions that he had once or twice observed it near marshes; and it is occasionally seen in the small village of Hamworthy, near Poole, in moist situations. It has been stated, by a gentleman of my acquaintance, that the brown varieties are confined to the sandy heaths, the colours of which are closely imitated by the surface of the body, and that the green variety frequents the more verdant localities just mentioned. Be this as it may, and it is a statement which at present I can neither confirm nor refute, it is certain that these varieties, mentioned by Linnæus, and seen by Muller, do exist in the place I have named, and within a comparatively short distance."

THE VIVIPAROUS LIZARD.†

This pretty, active little creature, fond of dry, sunny banks, thickets, and copses, has been found in great abundance at Southend, Essex, in the wooded pleasure-grounds which decline to the Thames. It is very common in most of our counties, and is freely scattered over the continent of Europe. It seldom exceeds five or six inches in length, and is very gentle and harmless.

One peculiarity of this species is its production of living young; and hence its name "viviparous."

"As in all the ovo-viviparous reptiles," observes Mr. Bell, "the covering of the egg is very thin, and merely membranous; in the viper, which produces its young alive, the covering, as in the present animal, is extremely thin, and very easily torn. Although I have alluded," he adds, "to the sun's influence as being the means of hastening the evolution of the embryo, in the eggs of oviparous reptiles, it is not to be concluded that the same source of warmth is unnecessary in the present and similar instances. The only difference is, that in the ovo-viviparous species the solar heat is communicated to the embryo through the medium of the mother; and hence we often see the pregnant female, about the month of June, constantly basking in the sun, and lying in such a position as to expose the body most fully to his influence. Every one who has watched the habits of our native reptiles must have seen the same circumstance in the female of the common viper, and may have observed how much

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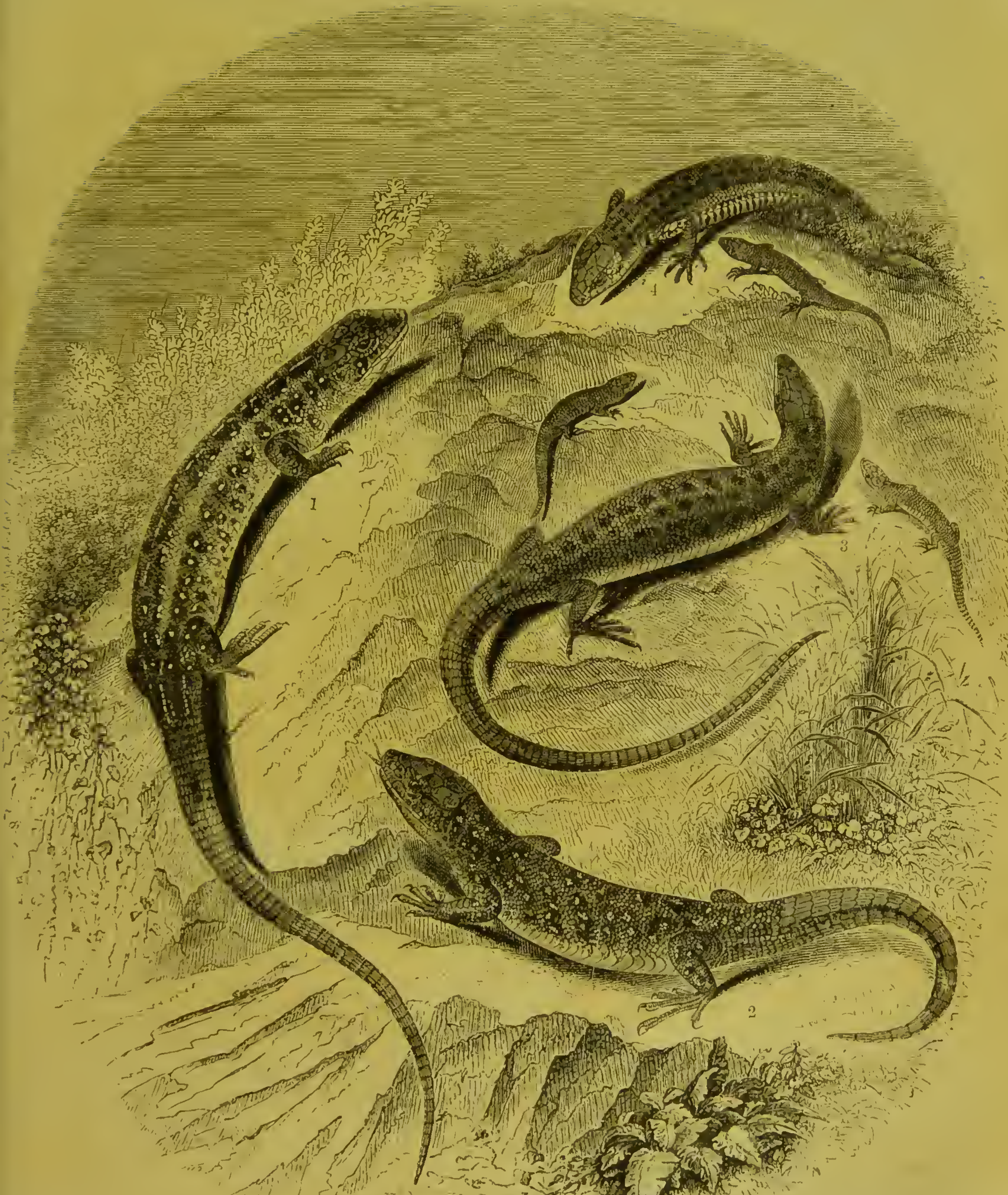
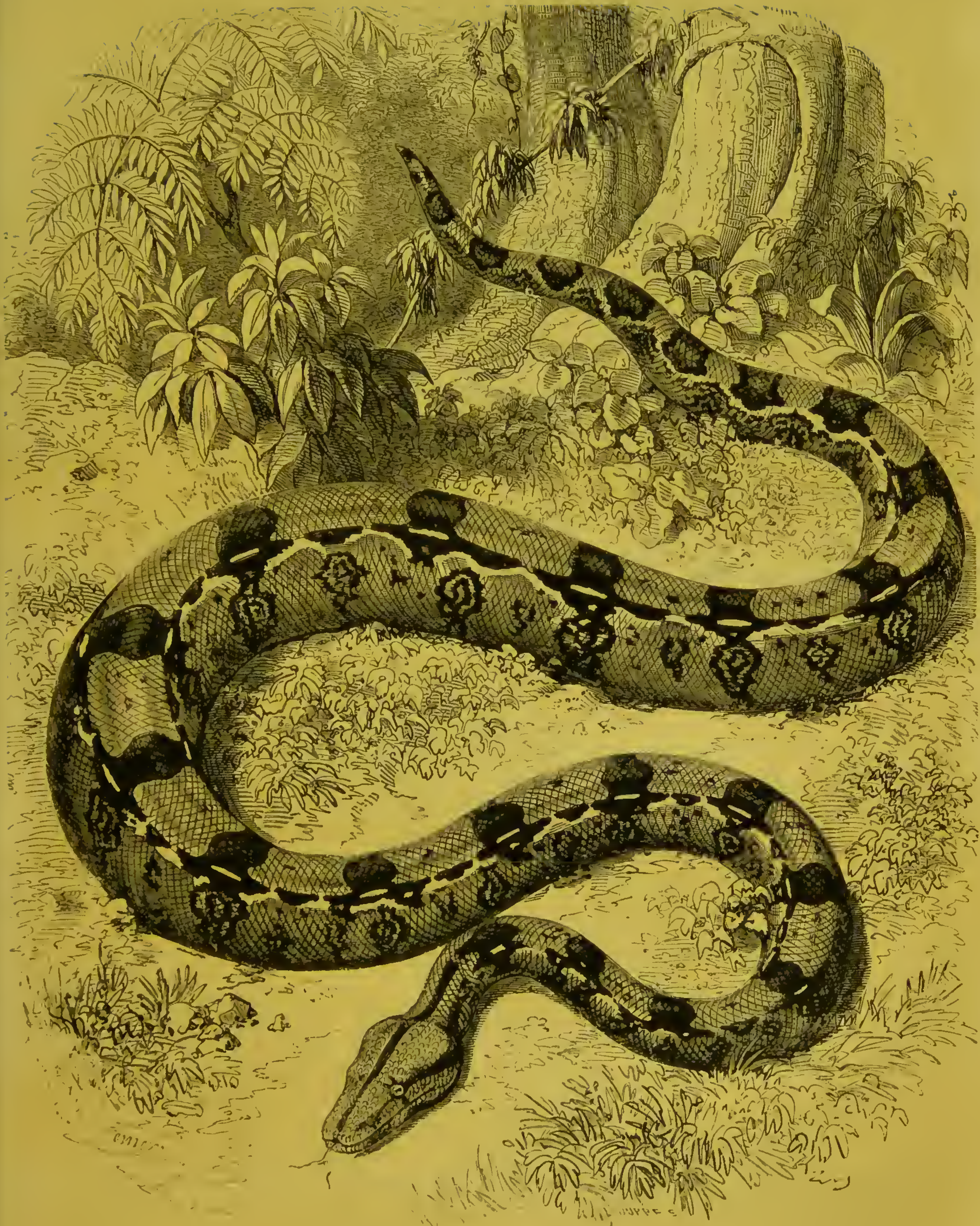
* Lacerta agilis.

† Zootoca vivipara.



THE SAND (1), THE WALL (2), THE VIVIPAROUS (3), AND THE FEMALE GREEN (4), LIZARD.



THE BOA CONSTRICTOR.

more reluctantly and tardily she leaves the genial spot than the male." This species varies considerably in markings and general colour.

THE GRAY WALL LIZARD.*

This creature is not found in the British Islands, but is very common in Western Asia, and over the greater portion of Continental Europe.

Hence, M. Latreille remarks: "Every one knows this lizard, and there are few who have not, in childhood, made it an object of amusement. It is almost domestic; and its presence is the more desirable as it thins the hosts of annoying insects. The ancients called it 'the friend of man.' It is a harmless little creature, and lives in the chinks of walls and old buildings, where it deposits its eggs. When, on fine spring days, a bright sunlight illumines a sloping verdant bank, or a wall which reflects the heat, this lizard may be seen stretching itself on the grass newly springing, or on the stones, as if in the enjoyment of pleasure; it revels in the grateful warmth, and testifies its satisfaction by gentle movements of its slender tail. It darts like an arrow upon its prey, or into some more commodious spot; but so far from flying on the approach of man, it appears to regard him with complacency. At the least noise, however, which alarms it, at the falling of even a leaf, it rolls itself up, tumbles down, and remains for a little time as if stunned; or it darts off, is agitated, returns, again conceals itself, re-appears, and in an instant describes a maze of tortuous circuits, which the eye can scarcely follow, folds itself up repeatedly, and at last retreats to some hiding-place, where it remains till its fear has subsided." Insects of various kinds constitute its food.

Of another genus† only one species is known, and may at once be recognised by the scales of the back and tail, which appear in the form of strong spines. The plates covering the head are soldered to the bones. There are no femoral bones.

In another genus‡ we find a creature well known in our island, as it is in many other parts of the earth.

THE SLOW-WORM.§

The body and tail of this creature are cylindrical, and snake-like; the tail is blunt; the head is covered with plates; the body and tail with smooth, imbricated scales. There are no limbs, and the eyes are very minute. It is often called the Blind-worm, and is perfectly harmless.

M. Latreille says: "This reptile usually lives in the earth, inhabiting holes, which it bores, and which it enlarges with its muzzle. It comes up for the purpose of breathing, raising its head above the surface of the earth in which it has established its retreat. It does this sometimes in winter, though snow may be on the ground. I have found it early in the spring, under moss and stones."

When irritated or alarmed, the slow-worm, by a forcible contraction of all the muscles of its body, becomes perfectly stiff, and then breaks in two with the slightest blow, or upon any attempt to bend it. Hence the term *fragilis* (brittle), given to it by Linnæus. This stiffening is the only manifestation of anger which it displays—at least, generally. We have often taken hold of this reptile, and carried it about, without its making any effort to bite, which, when much irritated, it will certainly do; but even then, so small is its mouth, and so feeble are its teeth, that it cannot inflict any injury. M. Latreille says its food consists of worms, beetles, frogs, small rats, and, as it is said, even toads. This is a mistake. Mr. Bell informs us that he repeatedly offered, but in vain, young frogs to the blind-worms, which he kept alive: they refused even insects. With regard to frogs and rats, it is absolutely impossible for the slow-worm to swallow them. It does, however, feed on insects, earthworms, and slugs, being particularly partial to the latter. Mr. George Daniel, in Mr. Bennett's edition of "White's Selborne," gives us the following interesting account:—

"A blind-worm, that I kept alive for nine weeks, would, when touched, turn and bite, although not very sharply; its bite was not sufficient to draw blood, but it always retained its hold until released. It drank sparingly of milk, raising the head when drinking. It fed upon the little white slug, so common in fields and gardens, eating six or seven of them, one after the other. It invariably took them in one position. Elevating its head slowly above its victim, it would suddenly seize the slug by the middle, in the same way that a ferret, or dog, will generally seize a rat by the loins. It would then hold it thus sometimes for more than a minute, when it would pass its prey through its jaws, and swallow the slug head foremost. It refused the larger slugs, and would not touch either young frogs or mice. Snakes kept in the same cage took both frogs and mice. The blind-worm avoided the water; the snakes, on the contrary, coiled themselves in a pan containing water, which was put into the cage, and appeared to delight in it. The blind-worm was a remarkably fine one, measuring fifteen inches in length. It cast its slough while in my possession; the skin came off in separate pieces, the peeling from the head being completed the last."

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* Lacerta muralis. † Trilobonotus. ‡ Anguis. § A. fragilis.

Mr. Bell observes that the shedding of the skin of the blind-worm takes place as in the true snakes. It is, in fact, taken off in one piece, when the animal is at liberty, and strong enough to effect it; and, like those reptiles, "it leaves the skin turned inside out, attached to brushwood, or other substances, which it has employed to entangle and secure, as it was coming off." The truth of this statement we can attest.

The blind-worm produces its young alive, in the month of June or July. They amount to ten or twelve in number, and are soon active and lively.

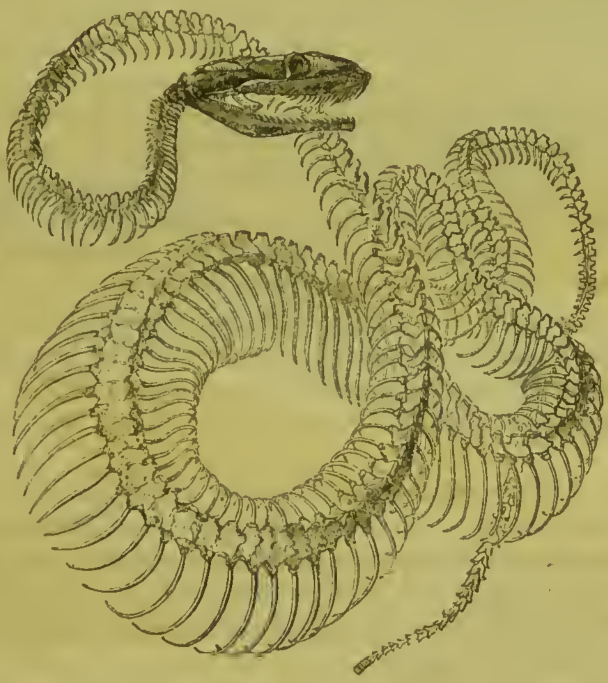
The general colour of this animal is yellowish brown, or yellowish gray, with a pearly lustre; a dark or black line runs down the middle of the back, and one or two parallel rows of small dark spots down each side; but these are not always to be seen. The under parts are of a bluish black, with whitish reticulations.

THE SALAMANDER LIZARDS (*Lacerta salamandra*).

SERPENTS.

In the order* of serpents we see exemplified the greatest possible state of simplicity to which a vertebrated skeleton can be reduced. That of a viper, for instance, consists mainly of a lengthened spinal column, with a head but little developed, and a series of ribs; but apparently destitute of limbs, and of the bones which usually connect those limbs with the trunk; there being neither sternum, nor scapula, nor pelvis.

The peculiar conformation of the skull and bones of the face, and the length and flexibility of the spine, may be traced to their mode of life. The food assigned to them is living prey, which they must attack and vanquish before they can convert it into nourishment. The boa usually seizes and destroys its victims by coiling the hinder part of its body round the trunk or branch of a tree, keeping the head and anterior half of the body disengaged; and then, by a sudden spring, fastening on the defenceless object of its attack, and twining round the body, so as to compress its chest, and put a stop to its respiration. Venomous serpents, on the other hand, coil themselves into the smallest possible space, and suddenly darting on the unsuspecting or fascinated straggler, inflict the quickly fatal wound. Their prey, moreover, is swallowed entire; and, consequently, the bones of the jaws and face are formed to admit of great expansion, and of great freedom of motion on one another.



SKELETON OF A SERPENT.

The vertebræ of serpents are very numerous. In the rattle-snake there are about two hundred, and in another † above three hundred have been counted. All are united by ball and socket joints, the posterior rounded eminence of each vertebra being received into the anterior surface of the next.

While peculiar provision has thus been made for extent of motion, extraordinary care is manifest in the security of the joints. Thus we find them efficiently protected from dislocation by the locking in, above and below, of the articular processes, and by the close investment of the capsular ligaments. The direction of the surfaces of these processes, and the shape and length of the spinous processes, are such as to allow of free lateral flexion, but to limit the vertical and longitudinal motions, and whatever degree of freedom of motion may exist between the adjoining vertebræ. That motion being multiplied along the column, the flexibility of the whole becomes very great, and admits of its assuming every degree and variety of curvation. The presence of a sternum, restraining the motions of the ribs, would have impeded all these movements, and would have also been an insurmountable bar to the dilatation of the stomach, which is rendered necessary by the habit of the serpent of gorging its prey entire.

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* Ophidia.

† Coluber natrix.

The mode in which the boa exerts a powerful pressure on the bodies of the animals it has seized, and which it has encircled within its folds, required the ribs to be moved laterally, as well as backwards, in order to elude the force thus exerted. The broad, convex surfaces on which they play give them, in this respect, an advantage, which the ordinary mode of articulation would not have afforded. The spinous processes in this tribe of serpents are short and widely separated, so as to allow of flexion in every direction. In the rattle-snake, on the other hand, their length and oblique position are such as to limit the upward bending of the spinal column, although, in other respects, its motion is not restricted. The vertebræ at the end of the tail are provided with broad transverse processes for the attachment of the first joints of the rattle.

But of whatever variety of flexibleness the lengthened body of the serpent may be capable, it appears difficult to conceive how these simple actions can be rendered subservient to progression on land; and yet they raise themselves without difficulty to the tops of the highest trees, and escape to their hiding-places with a quickness which eludes observation and baffles the efforts of their pursuers.

The enigma is solved partly by the structure of the skin, which, in almost every species, is covered with numerous scales, and partly by the conformation of the ribs. The edges of the scales form rough projections, which are directed backwards, so as to catch the surfaces of the bodies to which they are applied, and to prevent any retrograde motion within. Each scale is connected with a particular set of muscular fibres, capable of raising or depressing it, so that in this way it is converted into a kind of toe, and thus the body rests on the ground by numerous fixed points of support.

This support is further strengthened by the connection of the ribs with the scales on the under side of the body. The ribs, in fact, come forward in succession, like the feet of a caterpillar. The mode in which they are articulated to the spine has evidently been employed in reference to this particular function of the ribs, which here stand in place of the anterior and posterior extremities, possessed by most vertebrated animals. In the ordinary structure, the head of each rib has a convex surface, that plays either on the body of a single vertebra with which it is connected, or upon the two bodies of adjacent vertebræ; but in serpents the extremity of the head of the rib has two slightly concave articular surfaces, which play on a convex protuberance of the vertebræ. This structure is attended with the advantage of preventing the ribs from interfering with the motions of the vertebræ upon one another.

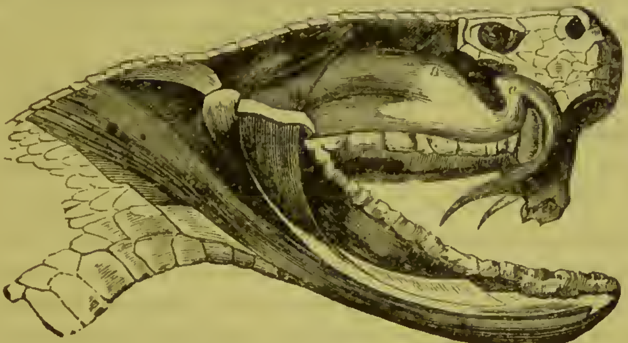
At these lower ends the ribs of one side have no connection with those of the other, nor are they joined to any bone analogous to a sternum. Each rib terminates in a slender cartilage, tapering to a point, which rests for its whole length upon the upper surface of one of the broad scales on the lower side of the body. The scales, which are thus connected with the ends of the ribs, and which are moved by means of short muscles, may be compared to hoofs, while the ribs themselves may be considered as performing the office of legs.

The ribs move in pairs, and the scale under each pair being carried along with it in all its motions, and laying hold of the ground by its projecting edge, becomes a fixed point for the advance of the body. This motion is beautifully seen when a snake is climbing over an angle to get on a flat surface. When moving on a plain, it alters its shape from a circular to an oval form, to one approaching a triangle, of which the surface applied to the ground forms the base. Five sets of muscles are provided, for the purpose of giving to the ribs the motions backwards and forwards, by which, as levers, they effect this species of progression. These muscles are disposed in regular layers; some passing over one or two ribs to be attached to the succeeding rib. In all snakes the ribs are continued backwards much beyond the region occupied by the lungs; and although the anterior set are subservient to respiration, as well as to progressive motion, it is evident that all those posterior to the lungs must be employed solely for the latter of these purposes.

The creeping or vermicular motion of serpents consists, in reality, of a succession of very short steps. But progress is accelerated by the curvations into which it throws its body; the fore part being fixed, and the hind part brought near to it; then, by a reverse process, the hind part is fixed, and the head projected forwards. By an alternation of these movements, assisted by the actions of the ribs, the serpent is enabled to glide onwards stealthily, and with considerable rapidity. But when greater expedition is necessary, they have a more hurried kind of pace, though one which exposes them more to immediate view. The body, instead of being bent from side to side, is raised in one great arch, of which the two extremities alone touch the ground; and these being alternately employed as points of support, are made successively to approach and to separate from each other, the body being propelled by bringing it from a curved to a straight line.

There is yet a third kind of motion, which serpents occasionally resort to, when springing on their prey, or when desirous of making a sudden escape from danger. Coiling themselves into a spiral form, by contracting all the muscles on one side of the body, and then suddenly throwing into violent action all the muscles of the opposite side, the whole body is propelled, as if by the release and unwinding of a powerful spring, with an impulse which raises it to some height from the ground, and projects it to a considerable distance.

The formidable weapon of a poisonous serpent consists of a complicated apparatus: the tooth or poison-fang (C), the instrument that pierces; the movable stock or handle in which the piercer is fixed, called the jaw; the muscles, or moving powers of the jaw; the bag (B) containing the lethal ammunition, called the "poison-sac;" the pipe which carries the venom into the tooth, or "poison-duct;" and the squeezer, or muscle that drives the venom from the bag along the duct, through the tooth, into the wound which it inflicts. The poison-glands and bags occupy the sides of the hinder half of the head, and in many snakes give a swollen appearance to that part, characteristic of each venomous species.



JAWS AND FANG OF A SERPENT.

The poison acts with more or less speed and effect, according to the species of serpent, the vigour of the individual, the season of the year, and also the part wounded. The subtle fluid mixes with the blood, and is conveyed with the rapidity of the circulation to the brain, on which its specific properties operate. It is a direct palsier of nervous action. No sooner does it act than the inlets of the senses begin to close on the outer world; the eyes are dimmed, the ears stopped; the tongue falters. The torpid brain then reacts on the heart, reducing its firm pulsations to feeble flutterings; the breath becomes scantier; the limbs grow cold, and it may be in ten minutes, in half an hour, or an hour, or at a later period, that death supervenes.

The nervous system of a poison-snake is proof against the specific action of its own poison, but not against that of another species. It is even stated that cobras bite each other without fatal consequences, but kill other snakes. The larger and more formidable hamadryas of India prey on other serpents, killing them by their envenomed bite, and then swallowing them. The naja of Africa, in like manner, kills and gorges the puff-adder; and the rattlesnake will strike and slay the poisonous moccassin snake, and afterwards seize and swallow it.

Serpents pass the colder season in a state of hybernation, and rouse from their lethargy in spring; but strange to say, as M. Latreille observes, their torpidity ceases when the atmospheric temperature is at the same degree as when they sought their retreats. "The electric fluid, one of those great agents in the animation of living beings, in conjunction with the warmth, operates in rousing these reptiles from their inactivity. They have more vital energy at the commencement of spring than on the approach of winter, because they are more or less susceptible of being animated by the electric fluid; the action of which is less decided in autumn than in spring." The influence of electricity upon hybernating animals is not confined to reptiles. The tanrec, a quadruped of small size, and allied to the hedgehog, may be instanced. In the Mauritius (of which island the animal is a native), the tanrecs "sleep through the greater part of the winter, from April to November; and they are only to be found when the summer heat is felt, which being generally ushered in by an electric state of the atmosphere, the negroes (with whom they are a favourite food) say they are awakened by the peals of thunder which precede the summer storms, or *pluies d'orage*.

Soon after their revival, serpents generally cast their slough, or external skin. Mr. Bell observes that it is a mistake to assign a particular period to the process. "Some have stated it to occur once, some twice, in the summer; but I have found it to depend, in our common snake, upon the temperature of the atmosphere, and on the state of health, and on the more or less frequent feeding of the animal. I have known the skin shed four or five times during the year. It is always thrown off by reversing it; so that the transparent covering of the eyes, and that of the scales also, are always found concave in the exuviæ. Previously to this outward change, the whole cuticle becomes somewhat opaque, the eyes are dim, and the animal is evidently blind. It now becomes, more or less, inactive; until at length, when the skin is ready to be removed, being everywhere detached, and the new skin perfectly hard underneath, the animal bursts at the neck, and creeping through the dense herbage, or low brushwood, leaves it attached, and comes forth in far brighter and clearer colours than before."

Dr. Barton in conducting his inquiries into the fascinating power ascribed to snakes, says: "I endeavoured to ascertain the two following points: first, what species of birds are most frequently observed to be enchanted by the serpents; and secondly, at what season of the year has any particular species been the most commonly under this wonderful influence. I supposed that this would furnish me with a clue to the whole mystery.

"Birds have an almost uniform and determinate method of building their nests; whether we consider the form of the nest, its materials, or the place in which it is fixed. Those birds which build their nests upon the ground, or the lower branches of trees, and in low bushes, especially on the sides of rivers and creeks, that are frequented by different kinds of serpents, have most frequently been observed to be under the enchanting faculty of the rattlesnake and others. Indeed, the bewitching spirit of these serpents seems to be almost entirely limited to these kinds of birds. Hence, we so frequently hear tales of the fascination of the cat-bird (a species of thrush), which builds its nest in low bushes, on the sides of creeks and other waters; the most usual haunt of the black snake and other serpents. Hence, too, upon opening the stomachs of some of our serpents, if we often find that they contain birds, it is almost entirely those birds which build in the manner I have mentioned.

"The rattlesnake seldom, if ever (never), climbs up a tree. It is frequently, however, found about the roots, especially in wet seasons. It is said to be often seen, curled round a tree, darting terrible glances at a squirrel; which, after some time, is so much influenced by these glances, or by some subtle emanation from the body of the serpent, that the poor animal falls into the jaws of its enemy.

"Is the animal's fear and distress a matter of any wonder? Instinct has taught different animals what are their enemies; and as the rattlesnake occasionally devours birds and squirrels, to these animals it must necessarily be an object of fear. In almost every instance I have found that the supposed fascinating faculty of the serpent was exerted upon the birds at the particular season of their laying their eggs, or of rearing their young: I now began to suspect that the cries and fears of birds supposed to be fascinated, originated in an endeavour to protect the nest or young. My inquiries have convinced me that this is the case.

"I have already observed that the rattlesnake does not climb trees; but the black snake (*Coluber constrictor*, Linn.) and some other species of the Coluber do. When impelled by hunger, and incapable of satisfying it, by the capture of animals on the ground, they begin to glide up trees, or bushes, in which a bird has its nest. The bird is not ignorant of the serpent's object. She leaves her nest, which contains the eggs or young ones, and endeavours to oppose the reptile's progress. In doing this, she is actuated by the strength of her instinctive attachment to her eggs, or of affection to her young. Her cry is melancholy; her motions are tremulous; she exposes herself to the most imminent danger. Sometimes she approaches so near the reptile, that it seizes her as his prey. But this is far from being universally the case: often she compels the serpent to leave the tree, and then returns to her nest.

"It is a well-known fact that among some species of birds, the female, at a certain period, is accustomed to compel the young ones to leave the nest; that is, when they have acquired so much strength as no longer to need all her care, though they still claim some. Their flights are awkward, and soon broken by fatigue: they fall to the ground, when they are frequently exposed to the attacks of the serpent, which attempts to devour them.

"In this situation of affairs, the mother will place herself upon a branch of a tree, or a bush in the vicinity of the serpent: she will dart upon the reptile, in order to prevent the destruction of her young; but fear, the instinct of self-preservation, will compel her to retire. She leaves the serpent but for a short time, and then returns again. Oftentimes she prevents the destruction of her young, attacking the snake with her wing, her beak, or her claws.

"Should the reptile succeed in capturing the young, the mother is exposed to less danger; for, whilst engaged in swallowing them, it has neither inclination nor power to seize upon the old one. But the appetite of the serpent tribe is great; the capacity of their stomachs not less so: the danger of the mother is at hand when the young are devoured; the snake seizes upon her, and this is the catastrophe which crowns the tale of fascination.

"Some years since, Mr. Rittenhouse, an accurate observer, was induced to suppose, from the peculiar melancholy cry of a red-winged maize-thief (a species of starling), that a snake was at no great distance from it, and that the bird was in distress. He threw a stone at the place from which the cry proceeded, which had the effect of driving the bird away. The poor bird, however, immediately returned to the spot. Mr. Rittenhouse now went to the place where the bird alighted, and, to his great astonishment, he found it perched upon the back of a large black snake, which it was pecking with its beak. At this very time, the serpent was in the act of swallowing a young bird, and from the enlarged size of the reptile's body, it was evident that it had already swallowed two or three other young birds. After the snake was killed, the old bird flew away.

"Mr. R. says, that the cry and action of this bird were precisely similar to those of a bird which is said to be under the influence of a serpent. The maize-thief builds its nest in low bushes, which are the usual haunts of the black snake."

Mr. Bartram, in a note quoted by Wilson, in his "American Ornithology," says, "Yesterday I observed a conflict, or contest, between a cat-bird and a snake. It took place in a gravel-walk, in the garden, near a dry wall of stone. I was within a few yards of the combatants. The bird pounced or darted upon the snake, snapping its bill; the snake would then draw itself quickly into a coil, ready for a blow; but the bird would cautiously circumvent it, at a little distance, now and then running up and snapping at it, but keeping at a sufficient distance to avoid a blow. After some minutes, it became a running fight, the snake retreating; and at last, it took shelter in the wall. The cat-bird had young ones in the bushes, near the field of battle."

In this account, we have a clue to the pretended fascination which snakes are said to be capable of exerting; the substance of the explanation is, that the bird is terrified, yet, urged by instinctive solicitude for her young, exposes herself to imminent peril in their defence, and often falls a sacrifice.

THE RINGED SNAKE.*

This is the only one of the kind we have in our island, but is very common, especially in the neighbourhood of water. It often attains to the length of three feet, and sometimes even more; the head is depressed and oval, with the gape extending its whole length. The teeth are small; the tongue is long, flexible, and deeply bifid at the point. The plates of the head are broad and flat; the scales of the back and upper parts are oval, and slightly marked with a keel. The tail is long and tapering.

The general colour of the upper surface is greenish brown, or gray, with a tinge of olive, with two rows of small black spots down the back, and a row of larger spots down each side; across the back of the neck, behind the head, is a collar of yellow, or whitish yellow margined behind with black. The under parts are of a leaden blue, marbled with black. The female is larger than the male, a circumstance common to the serpent tribe generally.

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* Natrix torquata: Ray. Tropidonotus natrix: Kuhl.

This active snake is to be found in copses, among brushwood, and old hedgerows, bordering moist meadows or water, to which it often resorts, swimming with the head above the surface, the body describing a series of the most graceful undulating movements.

A friend of the writer's, passing by a small sheet of water, between Bakewell and Buxton, observed a snake quietly swimming towards the bank. He hastened to the spot for which it was making, when, on seeing a man, it stopped, and allowed itself to sink down gently to the bottom, a few yards distant from the water's edge. The water was very clear, so that it could be seen distinctly. It lay with its head slightly elevated, and its body partially concealed by a stone; and it was evidently watching its observer. It kept its unaltered attitude for more than ten minutes; at last, with a cautious, stealthy movement, it turned round, and rising to the surface, with its head scarcely above it, not elevated, it slily made its way towards a thick bed of water plants, where all trace of it was lost. It thus appeared that the lungs are so capacious as not only to allow the snake to be buoyant on the water, but to remain beneath for a considerable time, without being obliged to come up for fresh air.

The ringed snake produces eggs which are covered with membrane resembling parchment; and which are agglutinated together in a chain, to the number of twenty or thirty. Hot-beds, heaps of manure, and similar places, are generally chosen by the female, in which to deposit them.

The same naturalist has also seen the ringed snake take frogs, a favourite food; and heard the piteous cry of the poor creatures, when seized by their terrible foe. Mr. Bell's description of the mode in which the frog is swallowed is perfectly correct. The snake pounces upon the frog, and "generally seizes it by the hind leg, because it is usually taken in pursuit. As soon as this takes place, the frog, in most instances, ceases to make any struggle, or attempt to escape. The whole body and the legs are stretched out as it were convulsively; and the snake gradually draws in first the leg it has seized, and afterwards the rest of the animal, portion after portion, by means of the peculiar mechanism of the jaws, so admirably adapted for that purpose."

Mr. Bell relates the following curious anecdote :—"On placing a frog in a large box, in which were several snakes, one of the latter instantly seized it by one of the hinder legs, and immediately after, another of the snakes took forcible possession of the fore leg of the opposite side. Each continued its inroads upon the poor frog's limb and body, until, at length, the upper jaws of the two snakes met; and one of them, in the course of its progress, slightly bit the jaw of the other; this was retaliated, though evidently without any hostile feeling; but after one or two such accidents, the most powerful of the snakes commenced shaking the other, which still had hold of the frog, with great violence, from side to side, against the sides of the box. After a few moments' rest, the other returned the attack; and, at length, the one which had last seized the frog, having a less firm hold, was shaken off, and the victor swallowed the prey in quiet."

A snake is in the Museum of the Zoological Society, which belonged to a gentleman named Christiman; he had kept it for eleven years, and to him it exhibited the greatest attachment. A lady of somewhat eccentric habits domesticated a number of snakes as pets; and not only did they recognise her, and would come and wreathe themselves round her arms or neck, but would often creep over and entwine themselves about her visitors, to their amazement and terror. It was otherwise with one belonging to Mr. Bell. He kept a snake that would come to him every morning at breakfast for a draught of milk, and would then crawl under the sleeve of his coat, enjoying the warmth; but he would fly from strangers, and hiss if they attempted to touch him.

Of the Colubrine group, to which the ringed snake belongs, no fewer than eighteen distinct species, with several varieties, are described by the Prince of Musignano (C. L. Bonaparte) in his work on European reptiles.

The largest of our European serpents,* inhabiting Italy and Spain, often attains the length of six feet. According to Metaxa, it was a snake of this species which is stated to have swallowed a child on the Vatican mount, in the time of Claudius. The body was taken out of this non-venomous reptile's stomach unmutilated. A respectable writer says, in allusion to this account :—"We do not think it at all incredible, and more likely to be true than otherwise. We remember seeing a very young child deposited on the pavement of a church in Lisbon, quite naked, to wait until some charitable person should order it to be buried, that a very moderate-sized snake might have swallowed, had such a one met with it in its haunts."

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* Coluber quadrilineatus.

The black snake* of America may be considered the representative in that country of our common English snake. It is very destructive among rats and mice, and is therefore favoured by the inhabitants of farms and dwellings in the country. It also devours squirrels, opossums, birds, lizards, and frogs.

Another reptile peculiar to the southern provinces of America is the harlequin snake. Audubon tells us that, "It glides through the grass with ease, and ascends to the tops of bushes, and among the branches of trees, to bask in the sun; children are fond of catching it, on account of its beauty. It feeds principally on insects, such as flies and small beetles."

THE BLACK SNAKE.

Dr. Smith, in his "Zoology of South Africa," figures most admirably, and describes a tree snake of that country, under the name of BOOMSLANGE (*Bucephalus Capensis*), separating it from the genus Dryophis, to which it is allied. This snake is regarded by the Hottentots as poisonous, yet erroneously; it has no poison fangs, but the posterior teeth are somewhat like fangs, in order to enable the reptile to seize birds with more security. The snake is subject to great variety of colouring; some are very beautifully variegated with olive, or yellow; some with pale brown, pink, and yellow; some are plainly brown. The eyes are large and full.

"The Boomslange," says Dr. Smith, "is generally found upon trees, to which it resorts for the purpose of catching birds, upon which it delights to feed. The presence of a specimen in a tree, is generally soon discovered by the birds of the neighbourhood, which collect around it, and fly to and fro, uttering the most piercing cries; till one, more terror-struck than the rest, actually scans its lips, and, almost without resistance, becomes a meal for its enemy. During such a proceeding, the snake is generally observed with its head raised about ten or twelve inches above the branch, round which its body and tail are entwined, with its mouth open, and its neck inflated, as if anxiously endeavouring to increase the terror which, it would almost appear, it was aware would, sooner or later, bring within its grasp some one of the feathered group.

"Whatever may be said in ridicule of fascination, it is nevertheless true, that birds, and even quadrupeds are, under certain circumstances, unable to retire from the presence of their enemies; and, what is still more extraordinary, unable to resist the propensity to advance from a situation of actual safety, into one of the most imminent danger. This I have often seen exemplified in the case of birds and snakes; and I have heard of instances equally curious, in which antelopes and other quadrupeds have been so bewildered by the sudden appearance of crocodiles, and by the grimaces and contortions they practised, as to be unable to fly, or even move, from the spot towards which the latter were approaching to seize them."

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* Coluber constrictor.

A varied family * now demands consideration; the species of which live in marshy places. Fixing themselves by the tail to some aquatic tree, they allow themselves to float, and thus entrap their prey. They are without venom, the absence of which is amply compensated by great muscular power, enabling some of the species to kill large animals by constriction, preparatory to swallowing them whole.

A gigantic serpent is said to have dwelt on the banks of the river Begrada, between Utica and Carthage, and to have destroyed many soldiers who had gone to its haunts for the purpose of procuring water. Regulus was, therefore, compelled to employ against it the most effective military engines then known, as darts hurled at him glanced off the scales, when a ponderous stone, hurled by one of them, slew the reptile; and his skin, when taken to Rome, measured a hundred and twenty-three feet.

Diodorus, the Sicilian, relates that in Egypt, under the Ptolemies, an enormous serpent, thirty cubits long, was taken alive, though not without the greatest difficulty. Crouching, very much at its ease, folded in a circle on the margin of the water, and quite motionless, but with the head just raised, the serpent could discern the approach of any quadruped which might come to quench its thirst, and waited there in expectation of its victim. Stimulated by the hope of gain, some hunters resolved to seize it alive, and carry it to Alexandria. Two perished in the first attack; but the courage of the survivors was unabated, and they proceeded to block up the entrance to the cave, to which the animal was accustomed to retire, and to place near this haunt a net of cords, duly adapted to the great strength of the serpent. Into this snare it fell; scared by the men, who, in a body, suddenly advanced towards it with their weapons, and making a great noise with loud, clanging instruments. Vain were the struggles of the reptile to break through the meshes of that strongly plaited cordage; and effectually secured, it was taken to Alexandria.

These accounts, though probably exaggerated in their details, show that the ancients were acquainted with gigantic serpents, and the terror excited by their formidable powers, of which travellers in the intertropical regions of the globe are still conscious.

THE PYTHON.

In a great variety of instances the process of reptile incubation demonstrably takes place; but it is stated in so valuable a work as the last edition of the "Encyclopedia Britannica"—a proof that even eminent men cannot be always *right*—that "no reptile is known to hatch its eggs."

On the 5th of May, 1841, however, a pythoness in France, usually very quiet and tractable, became uneasy and irritable, and on the following day laid fifteen eggs, with soft shells, of a gray, ashy colour, and slightly inflated with air. The process commenced at six o'clock A.M., and ceased at half-past nine P.M. Left to herself in her box, she gathered her eggs in a heap, and so twined the lower part of her body around them, that she formed a sort of spiral cone, of which her head was the summit; and so well were the eggs covered, that one only was visible.

Noli me tangere—"touch me if you dare"—was her motto for the time. On any attempt being made to approach the eggs, she repelled the intruder by violent contractions of the trunk; but at last, so impatient did she become, that any one who ventured on doing so, was in danger from her fangs.

Such animals are usually described as "cold-blooded," but in this instance the heat of the body was easily felt by the hand; and on a thermometer being placed on the top of the cone containing the eggs, the mercury rose to 73° Fahr., though the temperature in the shade was only 52°, and that of the room only 50°.

After fifty-six days of hatching, during which the pythoness did not change her position for an instant, the shells began to break, and the heads of the young ones appeared; but the little animals remained within, never showing more than the two extremities of the body for one day. On the 3rd of July most of them extricated themselves altogether, and crawled about on all sides, the last obtaining its freedom on the 7th. Of the fifteen eggs, however, only eight were hatched, the others being crushed or broken. During the whole time the pythoness manifested no desire whatever for food; but on the twentieth day the keeper placed a bucket of water within her reach, into which she instantly plunged her head, and drank about two tumblers full. She drank five times afterwards in the same way, as if she were in a feverish state. It was not until the 3rd of July, early in the morning, that she showed any inclination to eat, and then, without quitting her position, devoured about six pounds of beef, after which she left her eggs, and never showed the least affection for her young. On issuing from the shell her offspring drank a large quantity of water, and plunged their bodies into it, but did not eat till they had thrown off their old skin and got a new covering, which took place between the tenth and fourteenth day.

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* Boidæ.

MALE AND FEMALE PYTHON—FEMALE INCUBATING.

Great attention was attracted during the early part of this year to a male and female python in the reptile-house of the Zoological Gardens, London; of which we give an engraving. The latter was long engaged in the process of incubation; but, probably, from the removal of the blanket to gratify the curiosity of the numerous visitors, the eggs became addled, and the fact just stated will remain for some time at least, the only one of the kind on record.

The pythons in the Zoological Gardens are fed with rabbits, which they destroy by winding round and crushing them; they are then more easily swallowed. The bones forming the jaws and face, so to call it—unlike what is seen in mammalia, where they are firmly locked together, and where the lower jaw moves on closely bound hinges—are all loose and unconnected, except by skin and ligaments.

A very remarkable circumstance occurred here some years ago. A large python, in a well-secured cage containing others, and of these one nine feet long, was fed one evening with three guinea pigs and a rabbit. The next morning the python nine feet long was missing, and as escape was impossible, the question arose, what could have become of it? The truth was soon evident; the other python, not much larger than itself, had swallowed it. How it was done no one could tell, as it must have happened in the night. The victim may have been torpid and incapable of resistance, or a terrific struggle have occurred before it was overpowered; but the fact was evident, in the victor lying torpid, and bloated to double his ordinary dimensions.

The captain of a country ship is said, while passing the Sunderbunds, to have sent a boat into one of the creeks to obtain some fresh fruits, which are cultivated by the few miserable inhabitants of this dreary region. Having reached the shore, the crew moored the boat under a bank, and left in its charge a Lascar, who, overcome by the heat, lay down under the seats and fell asleep. While thus unconscious, a huge python emerged from the jungle, and was coiling its body round the sleeper, when his companions arrived, and severed a portion of its tail, which so disabled it, that it no longer had the power of doing mischief.

In the Dutch colonies of the East Indies, André Cleyer, a credible traveller, purchased of the hunters of the country an enormous serpent, in the body of which he found a deer of middle age, altogether entire, with its skin and limbs. In another of the same species, he found a wild he-goat. with its horns; and a third had evidently swallowed a porcupine, with its quils. He also states that a woman became the prey of a reptile of the same genus, in the island of Amboyna, and that this kind is sometimes kept for the purpose of attacking buffalos, in the kingdom of Arracan, on the frontiers of Bengal. Nor need such statements excite suspicion, when Prince Maurice of Nassau Siegen, one of the governors of Brazil, assures us that he himself was an eye-witness of stags, other bulky animals, and even a Dutch woman, being devoured in this manner, in the region of South America where he commanded. Father Gumilla, in his "History of the Orinoco," recounts analogous facts concerning a serpent, which he calls Bajo; and a multitude of others of the same kind may be found in the works of travellers.

The gardens of the Zoological Society contain three species of Python. The West African Python;[*] the Royal Python,[†] and the Reticulated Python.[‡]

Dr. Smith describes a Python,[§] which he met with, among others, in Southern Africa. This snake, or one resembling it, was formerly an inhabitant of the districts now within the Cape colony, and the traditions of the older Hottentots abounded with instances of its so-called miraculous powers. Of late years it was not to be found within a hundred miles of the boundary of the colony, and few specimens have been observed nearer than Port Natal. Occasionally it attains to a very large size, and according to the natives, individuals have been seen whose circumference was equal to that of a stout man. One skin was seen by Dr. Smith, which measured twenty-five feet, though a portion of the tail was wanting.

This python feeds on quadrupeds, and for some days after swallowing its food remains in a torpid state, and may then be easily destroyed. But the South Africans have seldom tried to rid themselves of a reptile they view with the utmost horror, as they believe it has a certain influence over their destinies, and affirm that no person was ever known to maltreat it without, sooner or later, paying for his temerity.

THE BOA CONSTRICTOR.[||]

THERE are four species of *Boa*, all of which have been described as the *Boa Constrictor;* and it is always difficult to identify any particular species of serpent referred to by travellers, on account of the loose manner in which the name is generally employed.

The Boa Constrictor is remarkable for the beauty of its markings. A broad chain, consisting alternately of large blackish and somewhat hexagonal marks, and of pale oval dashes, extends along the back. These gigantic snakes frequent the marshes, and luxuriant margins of the rivers, and fresh-water lakes of intertropical America, and reign the terror of man and beast. They can climb, swim, and dart along the ground; and hence there is no safety for the deer in its swiftness, or the monkey among the branches, or the large fish in the waters.

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[*] Python sebæ. [†] P. regius. [‡] P. reticulatus. [§] Python Natalensis.

[||] Boa constrictrix: Schneider. Constrictor formosissimus: Laurenti.

To these varied powers, combined with a nature daring, ferocious, and bloodthirsty, the ancient Mexicans rendered religious veneration. Their supreme divinity was represented with a snake in his hand, or coiled round him and his altar.

> "On a blue throne, with four huge silver snakes,
> As if the keepers of the sanctuary,
> Circled with stretching neck and fangs displayed,
> Mexitli vate: another grown snake,
> Belted with scales of gold his monster bulk."

To adopt the words of M. Lacépède, in reference to the boa, "This great power, this indomitable force, its gigantic length, the lustre of its scales, the beauty of its colours, have inspired a sort of admiration, mingled with affright, in the minds of most people in a savage condition; and, as all that produces terror and admiration, every creature that appears to be endowed with a great superiority over other beings, hardly fails to create in minds little enlightened the idea of a supernatural agent, it was not without religious fear that the ancient inhabitants of Mexico regarded this serpent. Whether they supposed that an enormous mass, executing movements so rapid, could not be stirred but by a divine inspiration, or that they only regarded the animal as a minister of the omnipotence of the God of heaven, it became the object of their worship. They gave it the title of 'emperor,' in order to designate the pre-eminence of its endowments; and, having adopted it as the object of their adoration, they devoted to it their particular attention. None of its movements, speaking in a general sense, escaped them; none of its actions were to them matters of indifference. As its protracted hiss caught their ear, they listened with religious trembling, for they deemed that these sounds, these signs of the various passions, or feelings of a being, which they regarded as supernatural and divine, must be connected with their destiny.

THE BOA AND ITS PREY.

"It has happened, that these hissings have been much stronger, and more frequent on the approach of violent tempests, pestilential diseases, cruel wars, or other public calamities. Indeed, it is frequently the case that epidemic maladies are often preceded by a violent heat, an extreme dryness, a particular state of the atmosphere, a highly electrical condition of the air, by which the snakes would be greatly excited, and led to utter hissings louder than usual: however this may be, the hissings of the boa, the 'divine boa,' were regarded as forewarnings of impending evils, and listened to with the utmost consternation."

A fearful picture of the blind and impious adoration paid to the ferocious boa, often tamed by the priests, for the purpose of overawing the multitude, is finely drawn by Southey, in his poem of "Madoc:"—

"Forth from the dark recesses of the cave
The serpent came; the Hoamen at the sight
Shouted; and they who held the priest, appall'd,
Relaxed their hold. On came the mighty snake,
And twin'd in many a wreath round Neolin,
Darting aright, aleft, his sinuous neck,
With searching eye, and lifted jaw, and tongue
Quivering, and hiss as of a heavy shower
Upon the summer woods. The Britons stood
Astounded at the powerful reptile's bulk,
And that strange sight. His girth was as of man,
But easily could he have overtopp'd
Goliath's helmed head, or that huge king
Of Basan, hugest of the Anakim:
What then, was human strength, if once involved
Within those dreadful coils! The multitude
Fell prone and worshipp'd."

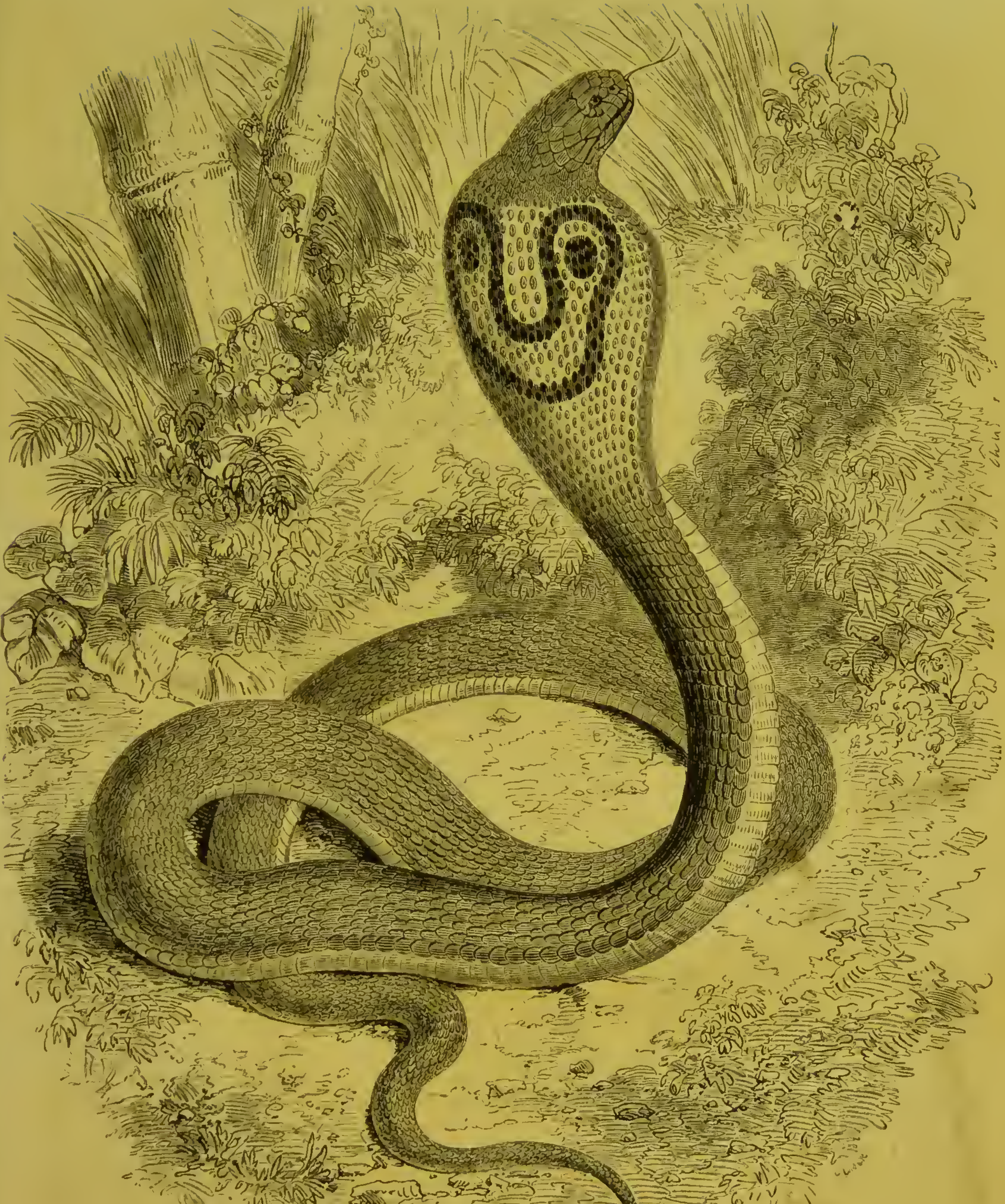
Stedman, in his expedition to Surinam, had an adventure with one of these boas, which shows their vast power and activity. On leaving his boat, he had scarcely proceeded above twenty yards through mud and water, when he discovered a huge snake rolled up under the fallen leaves and rubbish of the trees; and so well was the animal covered, that it was some time before he distinctly perceived the head of the monster, which was distant from him only about sixteen feet. It was rapidly vibrating its forked tongue, and its eyes, from their uncommon brightness, glittered like sparks of fire. He raised his gun, and fired; but missing the head, the ball went through the body. In a moment the animal struck round, lashing the ground with such force as to cut away all the underwood as if with a scythe, while the mud and dirt flew in all directions. Following up the attack, Stedman, who at first retreated, now ventured on, and found the snake at a short distance from the former station, quietly lying among fallen leaves, rotten boughs, and moss, which concealed all but the head. He fired again; the animal was again wounded, and violently flounced about, throwing a shower of mud and dirt around. At the third fire, the animal was shot through the head, and soon expired. The length of this snake, which the negroes declared to be young, was upwards of twenty-two feet; and its thickness that of a boy about twelve years old.

On the 3rd of October, 1851, one of the boas of the Zoological Gardens swallowed his bed, to wit, a large railway blanket wrapper, instead of two rabbits, which had been left him for his supper; when the problem propounded was the life or death of the reptile. Thirty-six days after, however, he evaded the catastrophe by beginning to disgorge the blanket. A watchman, going his nightly rounds, caught him in the fact; he presently called another watchman to his side, and entering the cage they assisted the boa, both of them giving a slow, careful pull at one end; and thus he completed his task.

The wrapper was about five feet wide and six feet long; it proved to be entire, with the exception of a few small holes and rents, and an appearance of rottenness in two or three places. The colours were nearly all discharged, so that the fabric was of a dingy, slaty gray.

After disgorging the blanket, the boa ate nothing during a whole week, but resumed his usual habits, by drinking a large quantity of water. This is said not to have been the first time such a feat has been performed in the Gardens; and a serpent is even stated to have remained the victor of his blanket.

Mr. M'Leod, in his "Voyage of H.M.S. Alceste," gives a painfully vivid account of a serpent sixteen feet long, and of about eighteen inches in circumference, in his attack on a goat, which was turned into his cage. The serpent, which at first appeared scarcely to notice the poor animal, soon began to stir a little, and turning his head in the direction of the goat, he at length fixed on it a malignant and deadly eye. The agony and terror of its victim seemed to increase, for, previous to the



THE COBRA DA CAPELLO.

serpent seizing its prey, it shook in every limb, but continued to butt at the serpent with unavailing force.

The first operation of the serpent, as he began to prepare for his banquet, was that of darting out his forked tongue, and at the same time rearing a little his head; then suddenly seizing the goat by the fore leg with his fangs, and throwing it down, it was instantly encircled in his horrid folds. So quick, indeed, and so instantaneous was the act, that it was impossible for the eye to follow the rapid convolutions of his elongated body. He then slowly and cautiously unfolded himself, till the goat fell dead from his monstrous embrace, when he prepared himself for swallowing it. Placing his mouth in front of the dead animal, he commenced by lubricating with his saliva that part of the goat, and then taking its muzzle into his mouth, he sucked it in as far as the horns would allow. These protuberances offered some little difficulty, not so much from their extent as from their points; however, they also in a very short time disappeared, that is to say, externally; but their progress was still to be traced very distinctly on the outside, threatening every moment to protrude through the skin. The victim had now descended as far as the shoulders; and it was an astonishing sight to observe the extraordinary action of the snake's muscles when stretched to so great an extent—an extent which must have utterly destroyed all muscular power in any animal that was not, like himself, endowed with very peculiar functions of expansion and action at the same time.

The whole operation of gorging the goat occupied about two hours and twenty minutes, at the end of which time the tumefaction was confined to the middle part of the body, the superior parts, which had been so much distended, having resumed their natural dimensions. He now coiled himself up again, and lay quietly in his usually torpid state for about three weeks or a month, when, his last meal appearing to be completely digested and dissolved, he was presented with another goat, which he killed and devoured with equal facility.

Another genus* contains the hooded serpents, among which some are very remarkable.

THE COBRA DA CAPELLO.

THIS creature is characterised by the head being covered with large plates, and by the skin of the back being dilatable, or capable of such expansion as to form a sort of hood, impressed with a mark something like a pair of spectacles. Their bite is extremely poisonous.

Often exceeding six feet in length, these snakes, when irritated, rise on their tail, or the posterior portion of their body, elevate their head, expand their hood, the scales being forced to a great distance asunder, hiss loudly, and by their actions, and the bright glance of their eye, show their boldness and resolution. They then look very beautiful, and, were there no danger, might be contemplated with pleasure; but they will not only attack, but repel the assault, pursue their assailant with great fury, and spring upon him with wonderful velocity. Of the genus *Naja* several species are known, but all agree in their general habits. The name of Cobra da Capello was originally given by the Portuguese to one kind;† but it has long been used as a general title.

On the 21st of October, 1852, Gurling, one of the keepers of the reptiles in the Zoological Gardens, was bitten by a Cobra da Capello, and died. The circumstances of the case are worthy of record. Gurling left his home, in company with another keeper, on the evening before, and they spent the night at a leave-taking party of a friend going to Australia. On returning to their duties, they had a quartern of gin at a public-house in Shoe-lane, another afterwards, and again another at eight o'clock. The gin-laden blood circulated through the brain; and reason, prudence, and the plainest sense of imminent hazard, were alike overpowered.

During the previous year, there had been an exhibition of Egyptian snake-charmers, but they had performed with cobras deprived of their poison-fangs. But the impression made on Gurling's mind coming uppermost when he entered the reptile-house, he determined to emulate the Egyptians with the serpents as they were. A newly-arrived Morocco poison-snake was first taken out of its cage, grasped by its middle, flourished aloft, and thrown like a lasso about his neck; when, happily for Gurling, it was not aroused so as to bite. An assistant-keeper, who appeared to enter the room at this crisis, entreated him, "for God's sake, to put back the snake!" but the infatuated man replied, "I am inspired," and laughed at the warning.

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* Naja.

† Naja tripudiano.

Having replaced the Morocco venom-snake in its cage, Gurling cried, "Now for the cobra!" and, lifting up the glass front of the cage, removed the one as he had done the other. The cobra was somewhat torpid, from the cold of the preceding night, and the man placed it in his bosom. It then revived and glided downward round his waist, its head emerging from beneath the back part of his waistcoat. The man grasped the cobra by the body, about a foot from the head, with one hand, drew it out, seized it lower down with the other hand, and was in the act of flourishing it aloft, as he had done the other snake, when, as he held it up in front of his face, the cobra, suddenly expanding its hood, struck him like lightning between the eyes, plunging its poison-fangs into the skin of one side of the bridge of the nose, and scratching the opposite side with the teeth of the lower jaw. The man was staggered by the blow; the blood streamed down his face. He called for help, and his companion fled; but how long he was away he could not tell the coroner's inquest, "being," as he said, "in a maze."

THE SERPENT-CHARMER.

When assistance arrived, Gurling was found seated in a chair, having restored the cobra to its cage, and closed down the front glass. He was still sensible and collected when placed in the cab that conveyed him to the hospital, but expressed, in already palsied speech, his full conviction of speedy death.

On reaching the hospital he appeared almost, if not quite, unconscious, and unable to support his head. His face was livid, and his respiration very imperfect. He moved himself uneasily, pointed to his throat, and moaned. The power of utterance was the first lost; then that of vision; and, lastly, that of hearing. The pulse gradually sank, the extremities became cold and torpid, and he died without a convulsion or a struggle, about an hour after receiving the wound. The heart's action was renewed by mechanical inflation of the lungs, and artificial respiration, which at one time raised the pulse to seventy-five beats in a minute, was kept up half an hour after the natural breathing had ceased, and when the nervous system was dead. Galvanism was tried, but it had no effect.

Not merely strange, but absolutely false, were the current reports of this catastrophe. But the examination that ensued exposed their character. The inquest jury, on proceeding to the Zoological Gardens to inspect the arrangements, discovered no lack of provident care in reference to them. The poisonous serpents were found kept in small cages or compartments, double-wired, and so fitted up as, with the most ordinary precautions, to insure perfect safety from casualties. By means of an iron rod, hooked at the end, and inserted through the small aperture at the top of each compartment, the reptiles are easily removed into the one next their own, and made secure there, while the keepers place food in and clean out the empty one. Visitors are enabled to see the serpents in perfect security through the thick glass fronts of the cages.

The secretary of the Zoological Society deposed on oath that "the keepers in charge of the snakes were instructed on no account, at any time, to do anything to the different cages when the snakes were in them;" and that, on one occasion, he had severely rebuked Gurling "for lifting the glass and for putting in food for the snake inside without removing it."

The reptile, it further appeared, immediately after its bite relinquished its hold; but the effect was such that it instantly swelled up Gurling's face. The right eye was swollen, but the left not at all; while the body presented no very unusual appearance, not being swollen or otherwise disfigured. Gurling died at the age of thirty, leaving a widow and a young family. The verdict of the jury was, of course, to the effect "That the deceased had lost his life by the bite of a serpent, known as the cobra da capello, when in a state of intoxication, and in consequence of his own rashness and indiscretion."

The trade of serpent-charming is very ancient, and at an early date Africa was the chief theatre of those who practised it, and were called psylli. Pliny says "serpents were frightened away by the mere smell of these psylli;" and informs us that they came out into Italy to show their feats, and even brought scorpions with them. They are still to be found exercising their craft all over Asia.

Egypt is, probably, still their principal abode. Here Bruce saw them, and here their performances were often observed by Mr. Lane. He states that he has met with many persons among the more intelligent of the Egyptians who condemn these modern psylli as impostors, but no one who has been able to account for the most common and interesting of their performances.

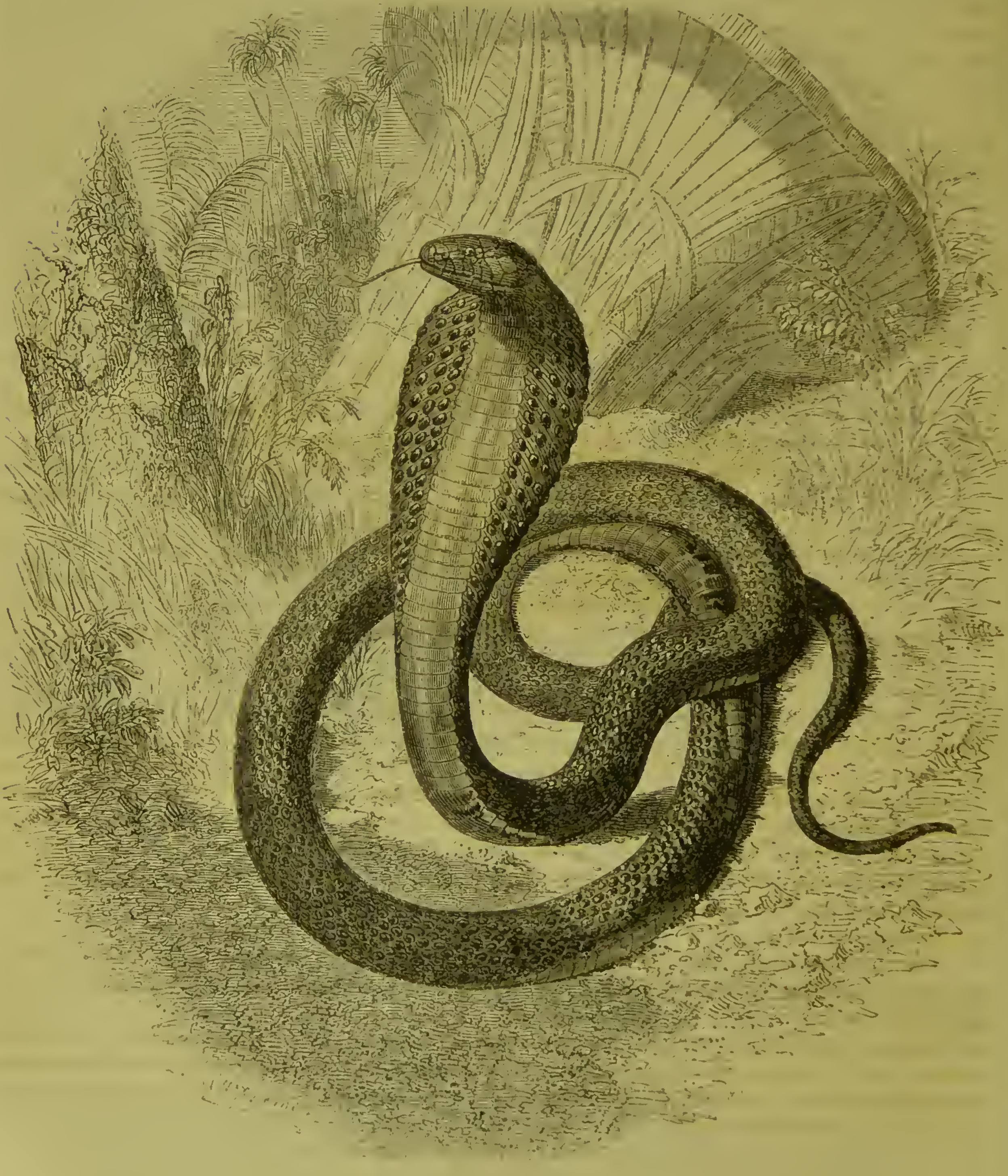
"The most famous snake-charmers," he says, "are durweeshes, or Mohammedan monks. The charmer professes to discover, without ocular perception (but perhaps he does so by a peculiar smell), whether there be any serpents in a house, and if there be to attract them to him, as the fowler, by the fascinations of his voice, allures the bird into the net. They have been known to do this in broad daylight, and when stripped naked.

"The performer assumes an air of mystery, strikes the walls with a short palm-stick, whistles, makes a clucking noise with his tongue, and spits upon the ground; and generally says, 'I adjure you, by God, if ye be above, or if ye be below, that ye come forth; I adjure you, by the great name, if ye be obedient, come forth; if ye be disobedient, die! die! die!' The serpent is generally dislodged by his stick from a fissure in the wall, or drops from the ceiling of the room."

It is sometimes suspected that a servant carries the reptile. The most expert charmers do not take with them venomous serpents until they have extracted their worst teeth. Many of them, like Pliny's psylli, carry scorpions in their caps, next to their shaven crowns; the sting, perhaps, having been blunted.

On the prophet's birthday the durweeshes perform some of their greatest wonders. Many live serpents were eaten during Mr. Lane's visit. Whenever a devotee did this, he was, or affected to be, excited to do so by a kind of frenzy. He pressed very hard, with the end of his thumb, upon the reptile's back, as he grasped it, at a point about two inches from the head; and all that he ate of it was the head and the part between it and the point where his thumb pressed, of which he made three or four mouthfuls, and threw away the rest.

Serpents are not, however, always handled with impunity, even by these people. A few years ago a durweesh, who was called "el-Feel," or the elephant, from his bulky and muscular form, and great strength, and who was the most famous serpent-eater of his time, having a desire to rear an enormous serpent which his boy had brought him, with others collected in the desert, put this one into a basket, and to weaken it kept it for several days without food. He then put his hand into the basket, to take it out, for the purpose of extracting its teeth, but it immediately bit his thumb. He called out for help; but there were only women in the house, and they feared to come to him, so that many minutes elapsed before he could obtain assistance. His abdomen was then found to be swollen and black, and he died in a few hours.



THE HAJE OF EGYPT.

The serpents on which the charmers of Egypt and India exercise their art are chiefly cobras; which are best adapted for the display of their powers. The air of mystery thrown over their operations had led many to withhold from them all credit. But that snakes may be brought under the influence of music appears to be beyond dispute.

On this point a gentleman, then of high station in the East India Company's service, made the following statement: "One morning, as I sat at breakfast, I heard a loud noise and shouting amongst my palanquin-bearers. On inquiry, I found that they had seen a large hooded snake (cobra da capello), and were trying to kill it. I immediately went out, and saw the snake climbing up a very high green mound, whence it escaped into an old wall of an ancient fortification. The men were armed with their sticks, which they always carried in their hands, and had attempted in vain to kill the reptile, which had eluded their pursuit: in its hole it had coiled itself up secure, whilst we could see its bright eyes shining. I had often desired to ascertain the truth of the report, as to the effect of music upon the snakes; I therefore inquired for a snake-catcher. I was told there was no person of the kind in the village; but after a little inquiry, I heard there was one in a village distant three miles. I accordingly sent for him, keeping strict watch over the snake, which never attempted to escape whilst we, its enemies, were in sight. About an hour elapsed, when my messenger returned, bringing a snake-catcher. This man wore no covering on his head, nor any on his person, excepting a small piece of cloth round his loins. He had in his hands two baskets, one containing tame snakes; one empty. These, and his musical pipe, were the only things he had with him. I made the snake-catcher leave his two baskets on the ground at some distance, while he ascended the mound with his pipe alone. He began to play; at the sound of music, the snake came gradually and slowly out of its hole. When it was entirely within reach, the snake-catcher seized it dexterously by the tail, and held it thus at arm's length; whilst the snake, enraged, darted its head in all directions, but in vain: thus suspended, it has not the power to round itself, so as to seize hold of its tormentor.

THE ASP.

"It exhausted itself in vain exertions, when the snake-catcher descended the bank, dropped it into the empty basket, and closed the lid. He then began to play, and after a short time, raised the lid of the basket; the snake darted about wildly, and attempted to escape; the lid was shut down again quickly, the music always playing. This was repeated two or three times; and in a very short interval, the lid being raised, the snake sat on its tail, opened its hood, and danced as quietly as the tame snakes in the other basket, nor did it again attempt an escape. This, having witnessed with my own eyes, I can assert as a fact."*

THE HAJE OF EGYPT.

This creature having the habit of elevating itself when approached, led the ancient Egyptians to believe that it was the guardian of the plains it inhabited; and hence they adopted it as the protecting deity of the world. It is this snake which they sculptured on the portals of all their temples, on two sides of a globe.

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* Mr. Schomberg states, in reference to a lizard (*Anolius bullaris*) common in the West Indies, that "they are often caught by boys, who take advantage of their fondness for musical sounds, arresting their attention, and then throwing a little noose over their head," as they perch in a listening attitude on the branches of the trees. *See Linn. Trans.*, vol. xvii., p. 560.

The Haje is closely allied to the Cobra da Capello, or spectacled snake of India, the chief apparent difference being its want of the singular yellow mark on the back of the neck, from which the latter species derives its name. Forskæl, a Swedish naturalist, who has written on the animals of Egypt, informs us that the jugglers of Grand Cairo have the art of taming the Haje; taking care, however, to deprive it of its poison fangs, though even then they avoid its bite when irritated. An asp is said to have been employed by Cleopatra as the instrument of her own destruction; and this species is generally considered to have been the one.

The Asp, or *Pethen*, of the Hebrews, is most probably a creature of this kind. Moses, alluding to its fierce and deadly nature, says of the heathen: "Their wine is the poison of dragons, and the cruel venom of asps;" and of the wicked, Zophar says: "His meat is the gall of asps within him." Not less remarkable is the prediction of Isaiah: "The sucking child shall play on the hole of the asp, and the weaned child shall put his hand on the cockatrice' den."

A family of snakes * may now be distinguished, which are thus characterised by Dr. J. E. Gray: "Face without any suborbital pits at the sides; upper jaw toothless, with fangs in front; rostral shields broad, band-like; scales keeled, except in one instance; † tail short and tapering."

THE COMMON VIPER.‡

THIS, happily for us, is the only British venomous reptile; and its venom, in our country at least, is not by any means so virulent as that of the serpent scourges in hotter regions. In the case of a bite, ammonia or hartshorn given internally, and fomentations applied to the part, to be gently rubbed afterwards with oil, are the remedies usually employed. The instances are very rare in which the bite proves fatal; and then the sufferer is greatly debilitated.

The viper varies constantly as to colour; the ground colour is mostly olive, sometimes deep brown, sometimes yellowish brown, and sometimes brick red. A mark between the eyes, a spot on each side of the head, and a broad zigzag stripe, composed of confluent rhomboidal spots down the back to the end of the tail, are darker than the ground colour, and sometimes black. A viper of which we give an engraving, is very common in France.

The Viper, like the viviparous lizard, brings forth its young alive. These, though but a few inches in length, crawl about, and are as fierce as the parent, throwing themselves, when molested, into an attitude of defence, and hissing with anger.

"Several intelligent folks," says White, of Selborne, "assure me, that they have seen the viper open her mouth to admit her helpless young down her throat, on sudden surprises, just as the female opossum does her brood into the pouch, upon the like emergencies; yet the London viper-catchers insist on it to Mr. Barrington, that no such thing ever happens." We are disposed to think that they are right; at all events, there seems to be no fact either adduced by White or any other naturalist, to sustain the contrary statement.

Mice, lizards, and nestling birds are the food of this species. "I have in my possession," says Mr. Bell, "a specimen of a small viper, taken on Poole Heath, in Dorsetshire, in a dying state, in the act of attempting to swallow a mouse, which was too large for it, the skin of the neck being so distended as to have burst in several places." In another instance, a viper was found in the neighbourhood of Lausanne which had seized a common lizard of full size, and swallowed it. The viper was a young one, and the lizard nearly as long as itself. It also appeared to have been very strong, and to have retained its vitality long after it descended into the stomach of its devourer. The consequence was, that it scraped with its little nails, until it made a hole through the side of the viper, and the fore leg was completely protruded. The specimen is preserved in the Musée Cantonal, at Lausanne.

The Æsping, called in England the Aspic, § is produced in Sweden. It is a small reptile, seldom exceeding six inches long, but more virulent, it is said, than the common viper, of which some naturalists regard it, and perhaps correctly, as a mere variety. Acrell states that Linnæus saw a woman perish in consequence of the bite of one, notwithstanding every assistance. The effects of the bite are followed by intense anguish and vomiting, the tongue swells and stiffens, the limb becomes inflamed, coldness supervenes, and occasionally death ensues.

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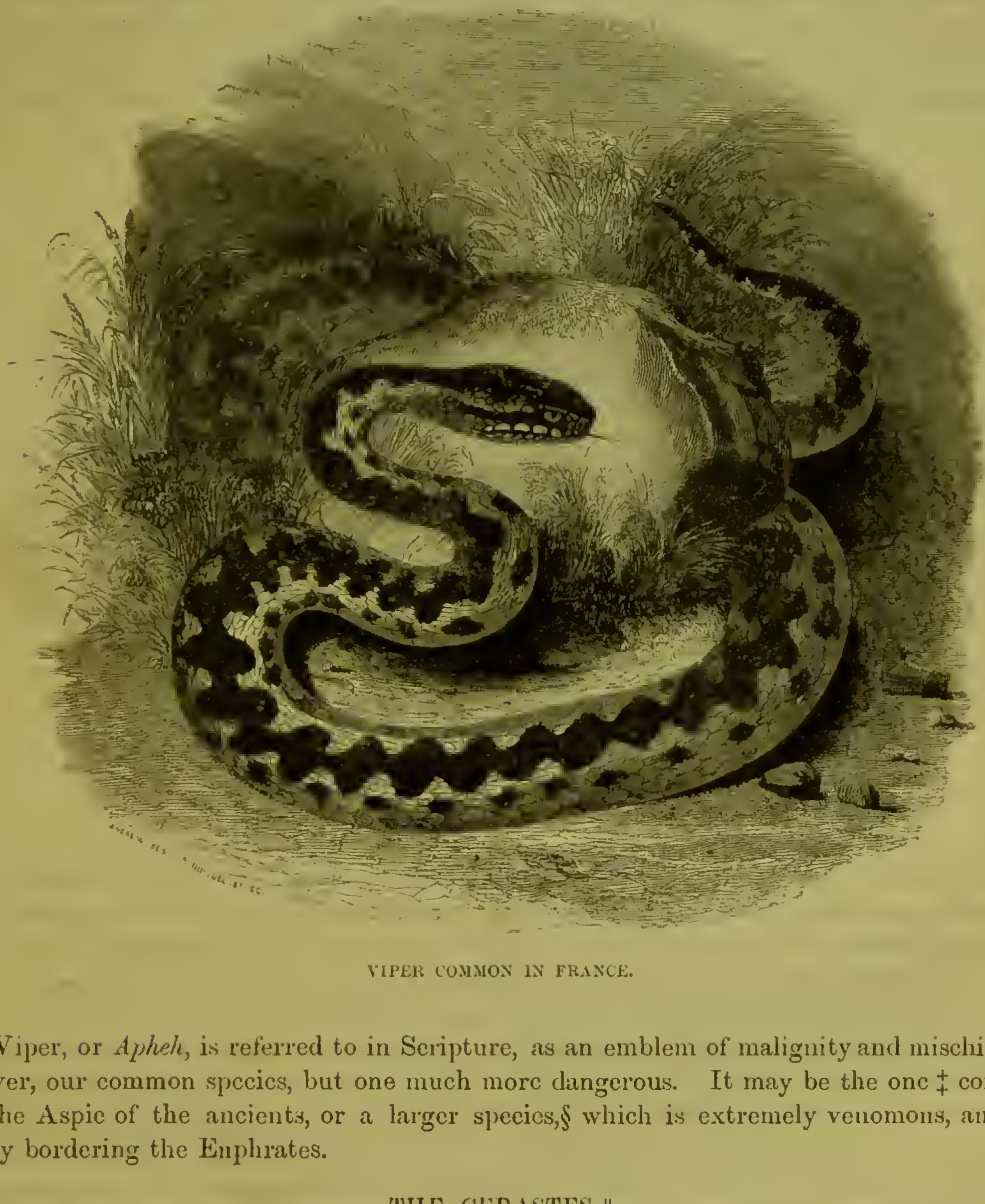
* Viperidæ.

† Acanthophis.

‡ Pelias berus.

§ P. chersea.

Another viper[*] is common among the rocks bordering the Danube, and on the mountains of Illyria. Its bite is very virulent, often producing death, and always, at least in summer, dangerous and painful effects. A distinct species[†] is found in Sicily and Italy.



VIPER COMMON IN FRANCE.

The Viper, or *Apheh*, is referred to in Scripture, as an emblem of malignity and mischief. This is not, however, our common species, but one much more dangerous. It may be the one[‡] considered by Latreille the Aspic of the ancients, or a larger species,[§] which is extremely venomous, and found in the country bordering the Euphrates.

THE CERASTES.[‖]

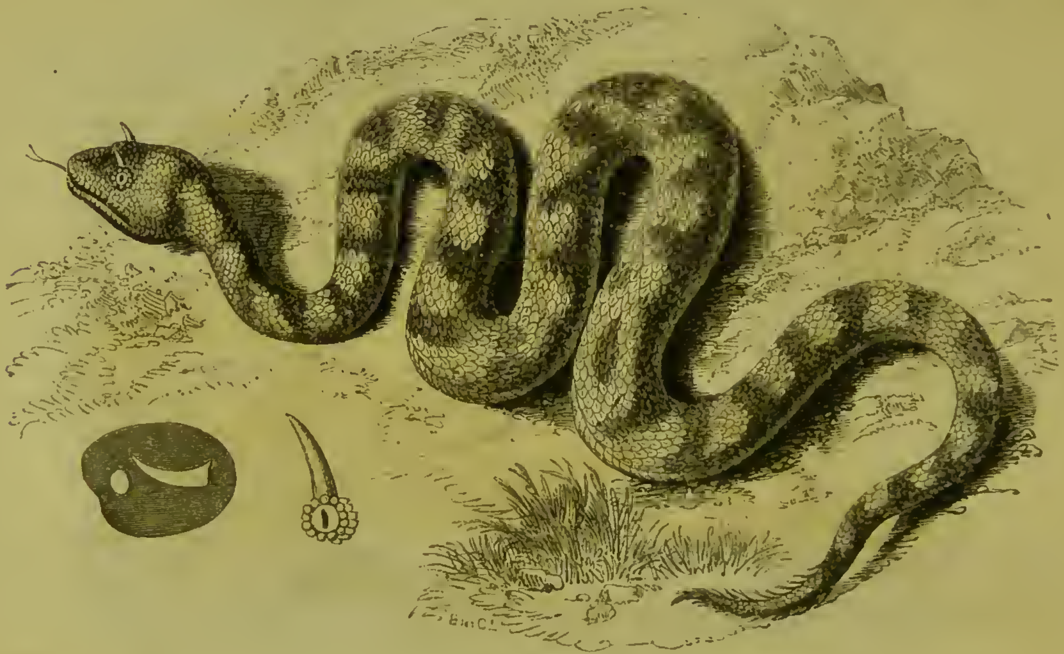
THIS serpent was well known to the ancients, and is distinguished by the presence of a little horny spur above each eye. Its general length is about two feet, and the colour sandy red or yellow, with irregular brownish markings, whence it assimilates with the colour of the sands of the desert, its abode, and cannot be easily distinguished.

"So grateful is heat to this snake," says Bruce, "that though the sun was burning hot all day, when we made a fire at night by digging a hole, and burning wood to charcoal in it for dressing our victuals, it was seldom that we had fewer than half-a-dozen of these vipers, which burned themselves to death by approaching the embers."

[*] Vipera ammodytes. [†] V. aspis. [‡] V. Ægyptiaca. [§] V. Euphratica. [‖] V. cerastes.

"As to the poison," he says, "it is very copious for so small a creature; it is fully as large as a drop of laudanum dropped from a phial by a careful hand. Viewed through a glass, it appears not perfectly transparent or pellucid. I should imagine the reptile has other reservoirs than the bag under the tooth; for I compelled one to scratch eighteen pigeons on the thigh, and all died in nearly the same interval of time; but I confess the danger attending the dissection of these parts made me so cautious, that any observations I should make upon these parts would be less to be depended on."

The following extract from the journal of an Eastern traveller, the Rev. John Sibree, refers to a creature of this kind:—"Oct. 14, 1859. This day found us still wending our solitary way to Mount Sinai, through the wilderness—all perfectly still, except the faint sound of the tread of the camels' tramp on the sand. We halted to take our luncheon, amidst the ruins of an old khan. After our repast, I was looking round upon the scattered stones, and saw what I thought to be one, in a circular form, particularly marked—something like the fossil called the ammonite (*Cornu ammonis*). I stooped down, put out my hand within a few inches of it, and was about to take it up, when, to my astonishment and horror, I discovered that it was a *coiled living serpent!* I shuddered, shrunk back, and called out to the dragoman, who, with several of the Bedouins, came and looked, and shuddered, and shrunk back too. The sheikh drew out his sword, struck the point of it into the head of the reptile, and then held it up. It was about two feet and a half in length. While it was writhing, we saw its fangs darting out on either side of its mouth. When it was cut open, there was seen its bag of poison, and in its stomach a young rat, half digested, which accounted for its torpid condition. The dragoman informed me that it was the Egyptian cobra, a venomous serpent of the most deadly kind. He said that he had seen two men who had been stung by the same kind of serpent, and that they immediately began to swell, to turn yellow, and were dead in half an hour! He added, that if I had been bitten (and it was most surprising that I was not) I should have been immediately a dead man. I praise God for this merciful and marvellous preservation."



THE CERASTES.

We pass now to another family of serpents.*

THE RATTLESNAKE.†

The colour of the head is brown, the eye is red, and the upper part of the body is yellowish brown, transversely marked with irregular broad black lists. The rattle is brown, composed of several horny membranous cells, of a pyramidal figure, articulated one within the other, so that the point of the first cell reaches as far as the basis or protuberant ring of the third, and so on; which articulation, being very loose, gives liberty to the parts of the cells that are inclosed within the outward rings to strike against the sides of them, and so to cause the rattling noise which is heard when the snake shakes his tail. It is a native of Virginia, the Carolinas, and other parts of America.

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* Crotalidæ.

† Crotalidæ horridus.

M. Palizot-Beauvois says:—"Frightful as this reptile appears to the eyes of prejudice, certain it is, that few animals are more peaceful and less inclined to do mischief than the rattlesnake. It never attacks animals on which it does not feed; and if it be neither alarmed nor molested it never attempts to bite. I have often traversed a path, at a distance of a foot from a rattlesnake, without its displaying the slightest desire to seize me. I have always been warned of its presence by the noise of its rattle; and while I have retreated without any great haste, it has never stirred from the spot, never changed its posture, but has given me time to cut a stick for the purpose of dispatching it. Dangerous as its bite is supposed to be—and which in fact it is, during certain months of the year, and especially if the tooth pierces a blood-vessel—still, when the reptile has retired to its winter abode, it may be handled without danger; not that it is to be found there in a state always of torpor and inactivity, for it is only in the middle of winter, and during hard frosts, that we find these animals intertwined together in ball-like masses, and totally torpid. On the approach of spring, the season in which, if I may so express it, serpents re-appear among the number of living beings, the Boiquira begins to move; at first, as if to rouse itself from its torpor, and try its strength, it crawls slowly among the roots of trees; by degrees it becomes more animated, and the more so as the time of its liberation approaches. Sometimes, a fine day temporarily hastens this epoch, and they creep forth from their holes, stretch themselves, and bask in the sun; but still they will not bite. Burdened with their old skin, which they are waiting for the time to throw off, their sight, as in all other serpents, is very defective; and they seem to me as if they are labouring under some malady, which takes away both the desire and the power to injure.

THE RATTLESNAKE.

"In the month of February, 1797, we went with Mr. Pence, of Philadelphia, to hunt for rattlesnakes, which are numerous in New Jersey; we caught nine, and almost all with the hand, in the space of two hours. Although they had already begun to sound their rattles, not one of them displayed the least inclination to bite.

"In summer this reptile is more dangerous; but as I have already said, it is never until after being alarmed, or touched, or struck; it then, indeed, instantly coils itself round, and warns by its hissing, and the rapid rattling of its tail, of its angry desire for vengeance. Then woe to the man or animal within its reach.

"Its bite, from the moment it emerges from its retreat till August, does not necessarily produce fatal results. It has been remarked, and the observation has not escaped the Indians, that from the month of August to the time when it is about to retire to its winter quarters, the period in which it takes the most food, it becomes terrible, and its bite mortal.

"We know that serpents in general retire, on the approach of winter, according to the nature of the ground, and the temperature of the place they tenant, either under large stones, or into holes which other animals have burrowed. The Boiquira gives preference to places in the vicinity of water. We have dug up many of their holes on the borders of the river Maurice. They were all tortuous, and led to a sort of chamber, distant from the entrance six or eight feet; and there we have found them in balls, and twined together. Our guide led us, on one occasion, into a marshy place, covered with a prodigious quantity of *sphagnum palustre*, a kind of moss, of which the stems are from six to twelve inches high. Having removed some of this moss, of which the top was frozen (the frost being so severe that it penetrated the naked ground to the depth of twelve or fourteen inches), we perceived many rattlesnakes, slowly creeping among the roots of the trees, immediately beneath the moss, and on an oozy ground, over which flowed running water not affected by the frost. Here I would make a passing remark, that this fact may be turned to account by persons employed in agriculture or gardening; this moss might be employed for the preservation of delicate plants, liable to be killed by the severity of winter.

"Numerous experiments prove that the rattlesnake eats indifferently all kinds of dead birds he meets with; and that he employs no supernatural means, as asserted, to seize his victims. He does not, however, eat frogs, to which the black snake (*Coluber constrictor*) is so partial."

Mr. Pence made some experiments on one of these reptiles, and on a rattlesnake, which he kept alive for five years. A live oriole was put into the cage of the latter, and there remained two days, during which time the rattlesnake never attempted to bite it. The bird betrayed no fear, and experienced no ill effects from the air of the cage. A dead bird being introduced was, however, eaten; while the living one fluttered about untouched.

A cardinal grosbeak was then put in, and this bird, so far from avoiding the reptile, pecked at ease about the cage, picked up the seeds, and even hopped upon the snake's back; but it retreated when it heard the noise of the rattle. Frogs, both living and dead, were offered, but the rattlesnake would not touch them; while the black snake seized them instantly.

At last, a common rat was scarcely in the rattlesnake's cage when the reptile appeared animated; the rat, as if alarmed, fled to the opposite side of the cage, away from the snake; the latter gave chase, and followed for about forty seconds very deliberately, the rat being eager to avoid its pursuer, and exerting itself to the utmost. The snake, then seizing a favourable moment, struck its prey. The rat ran bewildered about; the snake lay motionless. At the end of a minute the rat became greatly swollen, died in convulsions, and was soon swallowed. Such a condition of the victim has, doubtless, given rise to the popular belief in the rattlesnake's power of fascination.

"Rattlesnakes," says a traveller in America, "are very rarely found in the 'beech' or 'green' woods—woods where beech, maple, ash, and birch timber predominate—but are most numerous on the dry and arid ridges of the hills, which are designated 'oak barrens.' In sandy soils, where pine timber generally abounds, these reptiles are exceedingly scarce, and excepting some sections of the upland prairies, and the river-hills, very few inhabit the wilderness of the 'far west.'

"In my many and long rambles in various parts of the country, I am not aware that I ran any great risk of being bitten by one of these much-dreaded snakes. I have been somewhat startled occasionally, it is true, on seeing them stealing away through the bushes and wild grass adjoining the path I have been pursuing; and in a few instances I must acknowledge having been a little alarmed on hearing them rattle the scales of their tails, thereby warning me to be on the 'look out.'

"Amongst persons the best capable of judging, because the most familiar with this matter, I believe there is no difference of opinion regarding this point, namely, that they always endeavour to escape from the presence of man; but when they find retreat impracticable, they then spring their rattles, as a warning that they are prepared to act on the principle of self-preservation; the first aggressors, I believe, they never are.

"The Indian tribes possess different antidotes against the bite of the rattlesnake, and also the bite or sting of other poisonous reptiles and insects; so that, although they possessed no knowledge of medicine as a science when the country was first settled by Europeans, yet it seems they had providentially become acquainted with many of the valuable secrets of nature. The secrets obtained from the Indians, in addition to the modern discoveries in medical science, tend, in some degree, to allay those apprehensions which once were entertained against the still obnoxious, but less dreaded rattlesnake.

"The first time I visited the banks of the Mississippi river, in the decline of a fine autumnal day, my guide, an old Canadian hunter of French extraction, conducted me to an indifferent looking house, self-styled a tavern, in the (then) small town of Kaskaskia, but even then the principal place on the almost uninhabited banks of that part of the Mississippi. I happened, however, not to be the only traveller in so remote a place; for I soon learned that a party of four or five individuals were to pass the night there. This party had been engaged on an exploring expedition up the Missouri river, and having ascended that river to a certain point, had travelled across the country separating these two rival streams, and were now on their way back to some of the new settlements on the waters of the Ohio.

"I was well pleased at finding there were other travellers who, like myself, were distant from the haunts of society and civilisation, and I presently found myself on familiar terms with the party.

"After a brief interview, they politely invited me to partake of the supper they had already bespoken; informing me, at the same time, that they felt peculiarly fortunate in having procured an excellent dish—in fact, a great delicacy, in a place where they expected to meet with but indifferent fare. What this great delicacy was they did not attempt to explain, and, having without hesitation accepted of their invitation, I felt no inclination to make any further acquaintance.

"When the hour of supper arrived, the principal dish, and, indeed, almost the only one on the table, appeared to me a dish of good-sized eels, fried. I, being the guest of my new acquaintances, had the honour of being first served with a plate of what the person who presided called 'musical Jack.' 'Musical Jack,' thought I, 'is some species of eel peculiar to the Mississippi and its tributary waters,' and taking it for granted that it was 'all right,' I forthwith began to ply my knife and fork.

"'Stop!' said the individual that occupied the bottom of the table, before I had swallowed two mouthfuls. 'You, sir, have no idea, I presume, what you are eating, and, since you are our guest for the time being, I think it but right that you should have no cause hereafter to think you are imposed upon. The dish before you, which we familiarly called "musical Jack," is composed of rattlesnakes, which the hunter who accompanies us on our tour of exploration was so fortunate as to procure for us this afternoon. It is far from the first time we have fared thus; and although our own hunter skinned, decapitated, and dressed the creatures, it was only through dint of coaxing that our hostess was prevailed upon to lend her frying-pan for so vile a purpose.'

"Although curiosity had on many occasions prompted me to taste strange and unsavoury dishes, I must confess that never before did I feel such a loathing and disgust as I did towards the 'victuals' before me. I was scarcely able to listen to the conclusion of this short address, ere I found it prudent to hurry out of the room; nor did I return till supper was over, and 'musical Jack' had been either devoured or dismissed their presence.

"As far as I recollect the circumstance, there was nothing peculiar or disagreeable in the flavour of the small quantity I ate; and when the subject was calmly discussed on the following day, one of the party assured me that he was really partial to the meat of the rattlesnake; although some of the other members of his party had not been fully able to conquer their early-conceived antipathy towards this snake; but that during their long journey, they had been occasionally prevailed on to make trial of a small quantity of the flesh, and were willing to own that, had they been ignorant of its nature, they should have pronounced it of a quality passably good.

"Ever afterwards in my visits to Kaskaskia, I narrowly examined any dish of a dubious character that was placed before me, in order to satisfy myself that it was not 'musical Jack.'"

Far otherwise was it with the Spaniards during their occupation of Louisiana; the rattle-snake was grateful to their accommodating stomachs. The officers in garrison on the heights of Fort Adam were accustomed to give premiums to the soldiers and Indians who brought in the largest and fattest of these reptiles. After being beheaded, untailed, skinned, and entirely drained of blood, they were cooked in various ways, and were said to taste very much like chicken. Nor was this provision for the table all: the skins of these creatures were tanned, and supplied the material of beautiful slippers, which retained all the variegated marks exhibited on the scales of the rattle-snake when alive.

This reptile appears at present to have only a limited range, and to be no longer found in many localities of America, where it was common before the intrusion of man on its haunts. It is not often met with in the forests, but prefers the more open country, where there is long grass, bushes, stones, and rocks, with swamps and marshes. When at rest, the fangs with which the snake is armed, and from which the deadly venom is ejected, are laid along the jaw-bone. But when the reptile finds that danger is inevitable, it springs its rattle, as if it would say, "You had better be off;" and well is it to be warned in time. A single smart blow with a thin stick will, indeed, disjoint any part of the vertebræ, after which they are comparatively useless; but, if once bitten, or if the fangs in the slightest degree perforate the skin, life oozes out rapidly, unless the wounded part is quickly cut out or scarified with fire. The fangs readily make their way, even through tough leather coverings, into the flesh, and infuse venom, varying in its quantity, according to the alarm or irritation of the animal. Audubon states that, when striking against any object, the venom will sometimes be thrown to a considerable distance. He saw one confined in a wire cage, when much enraged, strike against the bars so furiously that the poison was sent several feet towards him. The intelligent have long regarded as a delusion the popular faith that the rattle-snake will not make an attack if the leaves of the white ash* are in the way. The details of a letter addressed by Judge Woodruff to Professor Tilliman are, however, decidedly in its favour. While on a visit at Poland, in Ohio, he went with two companions to the Mahonning river, for the purpose of shooting deer, and on a bank, fifteen or twenty yards from the edge of the stream, they discovered a large rattle-snake. It appeared to have left its den in the adjoining rocks, and was slowly advancing across a smooth narrow sand-beach towards the water; but on hearing voices, or from some other cause, it stopped, and lay stretched out with its head upon the ground.

It now occurred to the Judge that a favourable opportunity was offered of trying whether or not the white ash leaves had their reputed power. Requesting his companions to keep watch over the reptile, he soon procured, with his hunting knife, a small white ash sapling, eight or ten feet in length; and, with a view to make the experiment more satisfactorily, he cut another sapling of the sugar-maple, and returned with his wands to the scene of action, with a result which he describes as follows:—

"In order to cut off a retreat to his den, I approached the snake in his rear. As soon as I came within seven or eight feet of him, he quickly threw his body into a coil, elevated his head eight or ten inches, and, brandishing his tongue, gave note of preparation for the combat. I first presented to him the white ash, placing the leaves upon his body. He instantly dropped his head to the ground, unfolded his coil, rolled over upon his back, writhed and twisted his whole body into every form but that of a coil, and appeared to be in great anguish. Satisfied with the trial thus made, I laid by the white ash.

"I now presented him with the sugar-maple. He lanced in a moment, striking his head into a tuft of the leaves, and the next moment coiled and lanced again, darting his whole length at each effort with the swiftness of an arrow. After repeating this several times, I again presented to him the white ash. He instantly stretched himself out on his back, and writhed his body in the same manner as he did on the first application. It was then proposed to try what effect might be produced upon his temper and courage by a little beating with the white ash. This was administered; but, instead of arousing him to resentment, it seemed only to increase his troubles. As the beating grew more severe, the snake frequently stuck his head into the sand as far as he could thrust it, seeming desirous to bore into the very earth, and rid himself of his unwelcome visitors. Being now convinced that the experiment was a satisfactory one, and fairly conducted on both sides, we deemed it ungenerous to take his life, after he had contributed so much to gratify our curiosity; and so we took our leave of the rattle-snake, with feelings as friendly, at least, as those with which we commenced our acquaintance with him, and left him at leisure to return to his den."

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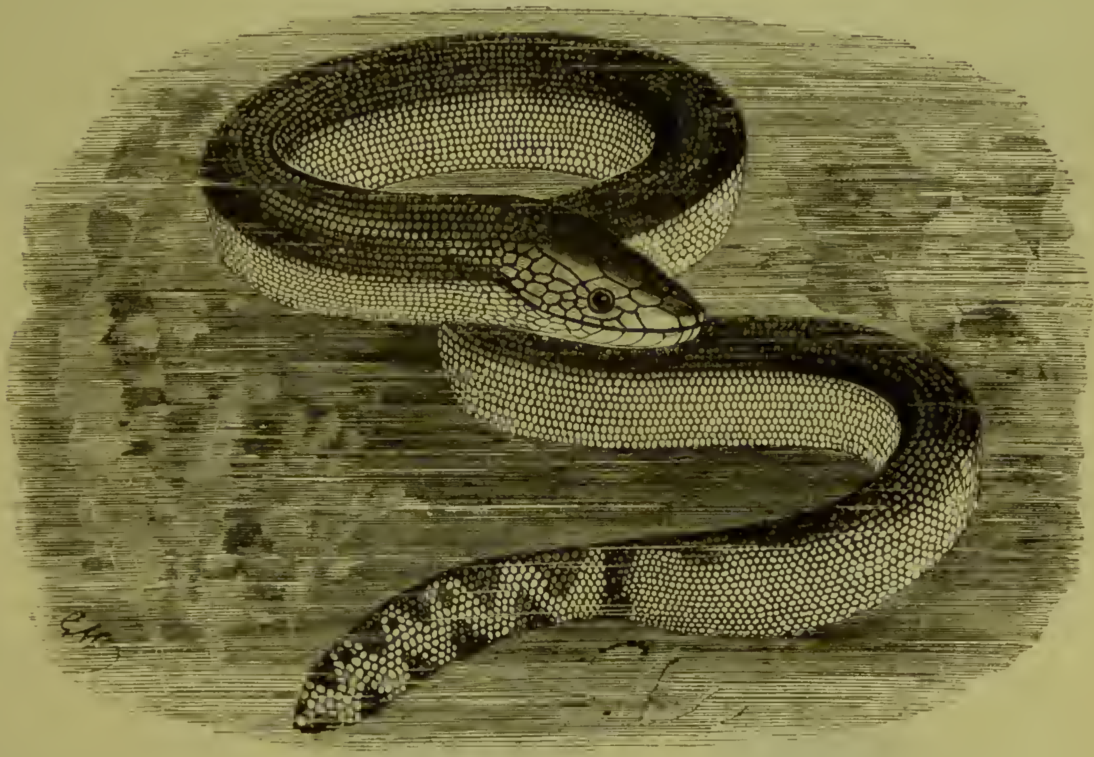
* Fraxinus Americana.

MARINE SNAKES.*

THE Marine or truly aquatic Snakes, are entirely confined to the intertropical latitudes. Excepting that they are destitute of fins, they are not unlike the eel, especially in the form of the tail, which is expanded in a vertical direction, and compressed laterally, so as to act the part of a paddle in the water, which they tenant. Only occasionally do these snakes visit land; and in the Indian seas, numbers collected together, forming shoals, may be seen swimming about, in pursuit of fishes and other prey. They are often carried out into the ocean by storms, and drifted on the shores of distant islands, to the terror of the natives.

The late Rev. John Williams stated that snakes, which were unknown at the Tahitian and Hervey Islands, abounded in the Samoan group. "I was informed," he says, "that there were several species of them, some of which were beautifully variegated. Those they procured for me were of a dark olive colour, about three feet long.



MARINE SNAKE (*Pelamys bicolor*).

"There are also Water Snakes; some of them beautifully marked with longitudinal stripes of yellow and black, and others with rings alternately white and black. The natives esteem both the land and sea snakes as good food. In the disorder occasioned by the leak in our ship, and our subsequent sinking at Tongataboo, I lost my snakes, and many other curiosities which I was carrying home. Very large lizards are found in the mountains of Savaii and Upolu, two of the Samoan group, and from the description I received I should conclude they were guanas."

Alluding, on another occasion, to the multitude of snakes in Savaii, Mr. Williams says: "Having expressed a wish to take a specimen with me to the Society islanders, who had never seen one, the ladies ran out of the house, and returned about half-an-hour afterwards, each having a live snake twisted about her neck."

It is remarked by the Rev. Mr. Johns that "he never found a river, or land, or a tank snake with a flat tail. Such as are sometimes found in rivers are brought in by the tide, and can live only a short while out of salt water. It is difficult," he adds, "to procure sea snakes, for though often caught in nets, they are held in such dread by the fishermen, that hardly any inducement can procure them."

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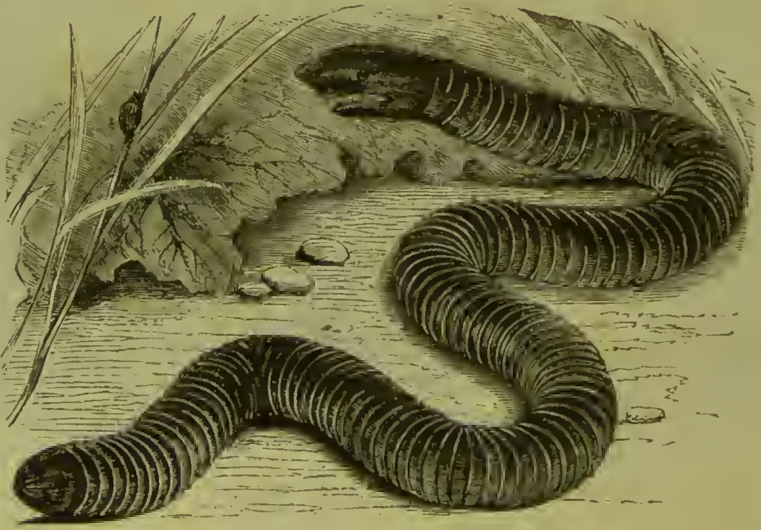
* Hydridæ.

Cuvier stated that all the sea snakes are highly venomous; this fact was denied by Schlegel; but Dr. Cantor, who was stationed in the East India Company's service on the Delta of the Ganges, has confirmed the opinion of the eminent French naturalist. In numerous experiments of his own, fowl, fish, and other animals invariably died within a few minutes after the bite was inflicted; and he mentions that a British officer did not survive the bite of a serpent caught at sea more than an hour or two. The genera and species of these marine snakes, as the collection of the British Museum will testify to any intelligent visitor, are very numerous. We give an engraving of one of them.[*]

AMPHIBIOUS REPTILES.[†]

THERE is still an order of Reptiles, differing essentially from the Tortoises, the Lizards, and the Serpents, but classed under one general name. They have no ribs, or rudiments of ribs only. Their skin is naked, smooth, and often moist, or lubricated with a fluid secretion, which, in some instances, is acrid, and apt to irritate the skin of persons handling it. In the common Salamander of Europe, the fluid poured out from the skin, when the creature is alarmed or injured, is very abundant, and white and glutinous.



THE RINGED CÆCILIA.

In the first division of these creatures,[‡] we find the Amphibia commencing life with gills, as organs for the aëration of the blood, which, in due time, become obliterated, and have lungs developed.

The animals of one comprehensive genus[§] are snake-like in their form, and destitute of limbs; the skin, though apparently and really naked, being smooth, viscous, and marked with a regular series of annular furrows, is not utterly destitute of scales. These, it is true, are very minute, and not to be found except by an examination of the skin itself. The head is depressed; the eyes, beneath the skin, are either very minute or wanting; the tongue is thick, rounded, and velvety; and they have both maxillary and palatal teeth.

These creatures bury themselves in the humid earth, or rather, the soft mud of marshy places, piercing through it like worms, often to the depth of many feet; and when in the water, swim like the eel, striking to the right and left with their tail. The Worm-like Cæcilia[‖] and the White-bellied

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[*] Pelamys bicolor.

[†] Amphibia.

[‡] Caducibranchiate Amphibia.

[§] Cæcilia.

[‖] Cæcilia lumbricoides.

Cæcilia* are found in Surinam; the Flat-tailed Cæcilia,† the Sharp-nosed Cæcilia,‡ and others are found in America; the Sharp-tailed Cæcilia§ is a native of Malabar; as the Glutinous Cæcilia‖ is of Ceylon and Java; and the Ringed Cæcilia¶ of Brazil, Cayenne, and Surinam. It is remarkable for the distinctness of the rings, which extend from the head to the tail.

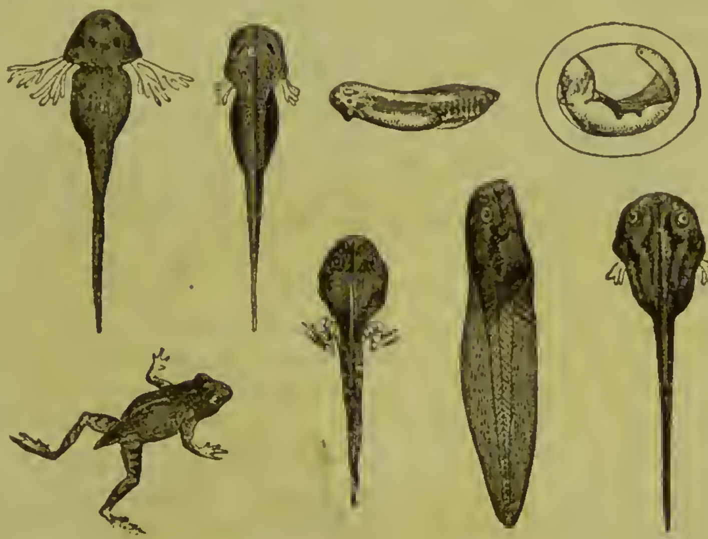
The next group of *Amphibia*** comprises the Frogs, the Toads, and their allies, which form a numerous and varied assemblage. In all these animals, the form of the body is short and broad.

Of one genus†† we give the following examples.

THE COMMON FROG.‡‡

This little creature, called the Red Frog (*Grenouille rousse*), is well known to all. There is scarcely a river or a pool on the margin of which it may not be found, or in the water of which either adults or their tadpoles may not be observed swimming. The development of the frog is very remarkable.

In the gelatinous eggs of the frog, the eye will detect certain black points, which are the immature young. One of these germs appears like a small globe, and in a few hours after deposition, the development of the tadpole commences. Very soon the head becomes prominent; a flattened tail is produced; while a projection on the side of the neck, scarcely visible at first, shoots out into a few filamentous tufts, which float loosely, and imbibe oxygen from the air which the water contains.



EXCLUSION OF THE FROG FROM THE EGG, AND THE STAGES OF ITS DEVELOPMENT.

Minute holders near the mouth, by which the tadpole subsequently attaches itself to objects for its support, are next developed. The mouth is still small, but first the nostrils and then the eyes appear. The branchial tufts increase, and divide into lobes; the tadpole, still confined in a curved position by the envelopes around it, now struggles to emancipate itself. Some time now elapses, when the caudal fin is expanded, and the branchial tufts, two on each side, consisting each of about five leaves, arrive at their maximum. In these branches, the circulation of the blood, as seen through a microscope, is a most beautiful object; the transparency of the parts renders every globule of blood distinct, as it is rolled along through the arteries and up the stems and leaves of the branchiæ, and returned down the opposite side.

The tufts soon diminish in size, and are at length so reduced as to become shrouded in the form of true gills, four in number, on each side, beneath a little gill-cover. The eyes have now increased; the mouth has enlarged, and acquired movable lips; and the holders are scarcely to be seen. The caudal web expands, and the little tadpoles swim about in shoals, seeking subsistence, and basking in the light. Ravenous as to food, it increases in size; and in a few weeks the hind legs begin to make their appearance, and first beneath the transparent skin of the back, at the origin of the tail. The fore legs succeed these, going on progressively, until they are adapted to the size of the body. Meanwhile, the lungs have been developed, and the power of inspiring air has been acquired, for which the as yet aquatic animal comes to the surface, taking it in its mouth, and then discharging it in the form of a round bubble below the surface. The gills begin now to be obliterated, while the tail, less and less requisite for the purposes of locomotion, either aquatic or terrestrial, gradually shrinks by a process of absorption; it soon disappears, and the frog is complete. Now it is fitted to leap among the herbage of the meadow, or to swim in the water, atmospheric air being its sole element of respiration.

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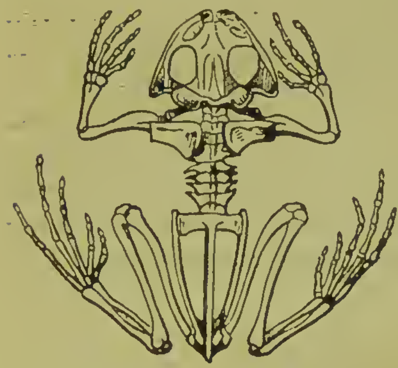
* C. albiventris. † C. compressicauda. ‡ C. rostrata. § C. oxyura. ‖ Epicrium glutinosum. ¶ C. annulata.
** Anoura: Dumeril. †† Rana. ‡‡ Rana temporaria.

The skeleton of the adult frog shows that the spinal column is comparatively much shorter than that of fishes, or indeed of any other class of animals; for it consists of only eight vertebræ, exclusive of those which have united to form the *os coccygis*. It was evidently the design of the Creator to consolidate the framework of the trunk, in which flexibility was not required for progressive motion, the performance of that function being transferred to the hind extremities, which are exceedingly large in proportion to the rest of the body. In every part of the skeleton there is a tendency to develop itself in a transverse direction, while the trunk is shortened as much as possible.


SKELETON OF THE FROG.

The mode in which the vertebræ are articulated together approaches to the structure of the higher classes of vertebrata. The body of each vertebra, instead of having at its posterior surface a cup-like cavity, terminates by a projecting ball, which is received into the cavity in the anterior surface of the next vertebra, so as to compose a true ball and socket joint, capable, when other circumstances permit, of a rotatory motion. But the vertebræ of the tadpole have cup-like cavities on both their surfaces, which play on balls of soft elastic matter interposed between them.

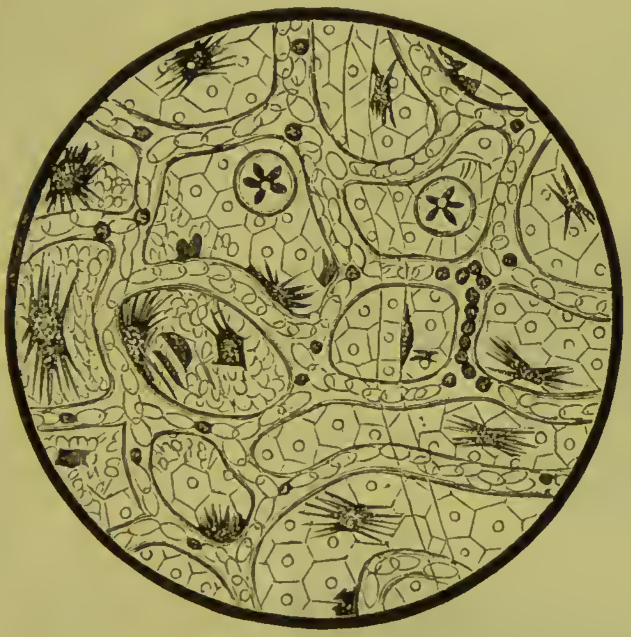
The mode in which the transition from this structure to that of the frog is accomplished is very curious. By carefully watching the process of ossification while this change was taking place, Dutrochet found that the gelatinous ball, on which both the adjacent vertebræ play in the tadpole, becomes gradually more solid, and is converted into cartilage. This cartilage afterwards becomes united by its anterior surface to the vertebra which is in front of it; and the whole then becomes ossified, so as to compose only one bone, its posterior surface remaining distinct, and continuing to play within the cup-like hollow of the vertebra which is behind it. The cartilaginous coccygeal vertebræ of the tadpole are lost long before there is time for their being ossified; but those nearest to the body are consolidated into one long and straight *os coccygis*, which, being joined to the sacrum at an angle, gives rise to the strange appearance of that part of the back of a frog; for it here looks as if it had been broken. At the same time, the spinal cavity is obliterated, that portion of the spinal marrow which had passed through it in the aquatic life of the animal being now withdrawn.

The theory of the spinal origin of the cranial bones receives considerable support from their structure and relative position in the skeleton of the frog. The cavity for the lodgment of the brain, which is inclosed by these vertebræ, is perfectly continuous in the same line with the spinal canal, which, indeed, it scarcely exceeds in diameter. The bones of the face are, at the same time, expanded laterally, so as to bear no proportion to the cranial cavity. The head plays on the vertebral column, by two lateral articular surfaces, formed upon the root of each leaf of the occipital bone, while its body is scarcely connected with the first cervical vertebra, and has no articular surface.

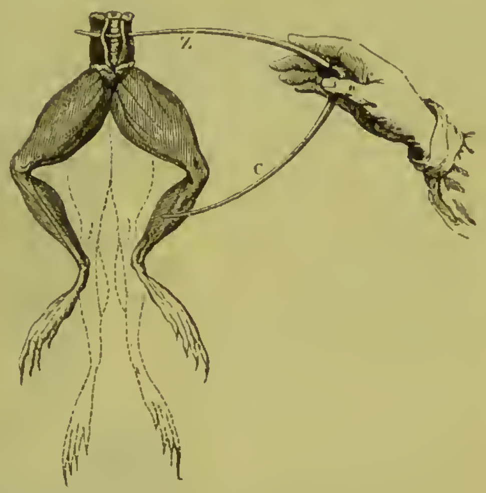
In place of ribs, there are only small, slender, detached bones, or rather cartilages, affixed to the extremities of the transverse processes of some of the vertebræ. They may be regarded as rudimental ribs. The pelvis is reduced to the simplest possible form, while it preserves its attachments to the spine. The sternum is large, and considerably developed. The radius and ulna are united into one bone. The bones of the arms and legs generally resemble, in their figure and connections, those of the higher order of *Mammalia*. There are five toes on the foot, and sometimes the rudiment of a sixth; the anterior extremity has only four toes, which are without claws.

The necessity of employing the same instruments for progression in the water and on land is probably the cause which prevents their having the form best adapted for either function. The hind feet of the frog, being well constructed for striking the water backwards in swimming, are, in consequence, less capable of exerting a force sufficient to raise and support the weight of the body in walking; and, accordingly, this animal walks awkwardly. On a short level plain it can proceed only by leaps, an action which the length and great muscularity of the hind legs particularly fit them for performing.

The foot of a frog is often selected for observation in the microscope, as beautifully illustrating the circulation of the blood. It is also worthy of remembrance that Galvani, Professor of Anatomy at Bologna, remarked on one occasion that when the limbs or nerves of a frog were put into communication with the muscles of the thigh, by means of an electric conductor, as represented in the engraving, the limbs were violently convulsed. Thus he discovered a force hitherto unknown, which he called animal electricity. But Volta, another Italian, observing that the effects were far greater when the connecting medium consisted of two different kinds of metals, inferred that the principle of excitation existed in the metals, and not in the nerves of the animal. He therefore argued that by their contact there was developed a small quantity of the electric fluid, which, being transmitted through the organs of the frog, produced the convulsive movements. And to this conclusion must be traced, among important discoveries, the invention of the electric telegraph.



CIRCULATION IN THE WEB OF A FROG'S FOOT.



DISCOVERY OF GALVANI.

The tongue of these animals performs a leading part in the capture and deglutition of the prey. Its structure, in the greater portion of this group, is altogether anomalous, and its insertion is equally at variance with the mode adopted in the other vertebrated animals. It is very soft, fleshy almost throughout, and is not supported at its base by an os hyoïdes. Its attachment is the reverse of that generally seen, for it is fixed in the concavity which is formed by the approach of the two branches of the lower jaw towards the symphisis.

This organ is provided with a tenacious viscous secretion; and, when it touches the prey, the latter adheres so firmly to it that it is carried back with the tongue into the mouth. There it is, in most cases compressed, involved again in a glutinous sort of saliva, and almost instantly submitted to the act of deglutition. The motion of throwing out and returning the tongue is often performed with a rapidity which the eye can hardly follow. The muscles, whose office it is to move the bones, cartilages, and other parts of the mouth, act more especially upon the lower jaw, upon the base of the mandible, and upon the tongue, which, after being shot forth, is returned and swallowed, as it were, with the captured prey, and the act of deglutition is continued till the food is lodged in the stomach.

The frog hybernates, like all our reptiles, passing the colder months of the year in a state of torpor, buried deep in the mud at the bottom of ponds or sluggish streams. There they congregate in multitudes, all huddled closely together, so as to form almost a continuous mass. Early in spring they re-appear, and during the month of March the female deposits her eggs in the water.

During summer the frog is very active and voracious, devouring the larger insects, and especially slugs, which are a favourite food. To the gardener or cultivator of culinary vegetables it, therefore, renders special service; and, as Mr. Bell observes, "this consideration ought surely to weigh, even with those who are inaccessible to the appeals of humanity, in favour of this harmless and much persecuted race."

The sudden appearance of frogs and toads in places where they were not previously seen is not an uncommon occurrence. In our own country, and in various parts of the Continent, violent rains have accompanied their appearance, and such showers have been and still are believed by some to be among the phenomena of Nature.

THE FROG.

"Naturalists," says M. Dumeril, "know that the sudden appearance of young frogs on the surface of the earth, and in places where they did not seem to exist previously, has in all times roused public attention and curiosity, the supposition being that they had fallen from the sky. We find, in fact, traces of this belief in Aristotle, in some passages of Athenæus and Ælian, and of the moderns, in Gesner; in many volumes of the 'Ephemerides of the Curious Things of Nature,' in the works of Ray, and those of Redi. Elaborate discussions have been entered into on the subject. Cardan was vigorously attacked by Scaliger, for having given credit to this sort of spontaneous production. Pison thought that these toads did not fall formed from the skies, but that they sprang from the animalising action of the rain on the clods of fertile earth. He was ably answered by Lentilius."

Redi, admitting the facts to a certain degree, proposed the following explanation :—"These toads and frogs do not appear until it has rained for some time; but these animals had been hatched many days previously; or, rather, having undergone their complete transformation, had quitted the water in which they had been developed as tadpoles. These little frogs, then, lay covered and concealed in the chinks of the earth, under stones and clods, where, in consequence of their lying motionless, and often also on account of their dusky colour, they escaped the eye." This is, doubtless, the true state of the case: concealed in fissures and crevices, and exhausted by drought, they lay till the welcome rain restored them to animation, and invited their sudden appearance.

"Dr. W. Roots, of Kingston," says Mr. Bell, "informs me that he was in possession for several years of a frog in a perfect state of domestication. It appears that the lower offices of his house were what is commonly called, underground, on the banks of the Thames. That this little reptile accidentally appeared to his servants, occasionally issuing from a hole in the skirting of the kitchen; and that during the first year of his sojourn, he constantly withdrew upon their approach; but on their showing him kindness, and offering him such food as they thought he could partake of, he gradually acquired habits of familiarity and friendship, and during the following three years he regularly came out every day, and particularly at the hour of meal-time, and partook of the food which the servants gave him. But one of the most remarkable features in this artificial state of existence was his strong partiality for warmth, as during the winter seasons he regularly (and contrary to the cold-blooded tendency of his nature) came out of his hole in the evening, and directly made for the hearth, in front of a good kitchen fire, where he would continue to bask and enjoy himself till the family retired to rest.

"There happened to be, at the same time, a favourite old domestic cat, and a sort of intimacy and attachment existed between these incongruous inmates; the frog frequently nestling under the warm fur of the cat, while the cat appeared extremely jealous of interrupting the comforts and convenience of the frog. This curious scene was often witnessed by many besides the family."

The Edible, or Green Frog,* as it is called, is a native of Continental Europe, the north excepted, some parts of Asia, and also of Northern Africa. This species is essentially aquatic, inhabiting either running or stagnant waters. Generally it is of a beautiful green, irregularly marked with black, or dark brown spots, and ornamented on the back with three stripes of a rich golden yellow; but in some, for there are many varieties, these are absent. On the Continent this species is in high request for its flesh, the hind quarters alone being used.

THE BULL FROG.†

AMERICA has several frogs of huge size and sonorous voice, of which one is the Bull Frog. According to Catesby, its croaking sounds are like the bellowing of a bull, and are louder when uttered below the surface. This statement is, probably, overcharged. Audubon simply says, its voice is louder than that of any other species, and may be distinctly heard at the distance of forty or fifty yards. He adds: "It is particularly fond of such small pure streams of water as are thickly shaded by overhanging bushes. It sits for hours, during the middle of the day, basking in the sun, near the margin of the water, to which it betakes itself by a great leap, at the least appearance of danger, diving at once to the bottom, or swimming to the opposite side. In the Southern States it is heard at all seasons, but principally during the spring and summer months. Its flesh is tender, white, and affords excellent eating. The hind legs, however, are the only parts used as food. They make excellent bait for the larger cat-fish. Some bull frogs weigh as much as half a pound. I have generally used the gun for procuring them, shooting with very small shot."

A resident at Fort Erie relates that near the town is a deep, muddy creek, with low and marshy shores, and here the bull-frogs are found in great numbers during the summer months. Standing at his own door, he could distinctly hear their sonorous music booming across the water, although the distance was over three miles.

Although naturally shy and timid, he succeeded in taming one, after an intercourse of a couple of months. He was then residing on the banks of a small lake, which was well stocked with various kinds of excellent fish, particularly one sort—those known by the name of "salmon-trout."

"During the summer," he says, "I used frequently to angle in different parts of the lake for them, and also would place floating lines across some of the convenient bays and inlets. My usual bait was a small live fish, to procure which I had to angle with a small hook, baited with a small worm, in the shallower water near the shore. One day, while I was thus employed, I observed a large bull-frog perched upon a prostrate tree, which lay partly immersed in the water. Having caught a sun-fish, just at the moment I first observed the bull-frog—and that sort of fish being the least desirable kind of bait for trout-fishing—without unhooking it, I swung it as near the frog as practicable. I saw that he anxiously watched the movements of the fish, and, after some further attempts, I succeeded in placing it within a few inches of him, when he darted quickly upon it, and had it in his capacious mouth in an instant. I then drew him gently towards the small skiff in which I was sitting; but as he approached it he struggled so violently, that he either let go his hold or accidentally lost it, for he disappeared in the water for a few seconds, when I observed his green head close along side of his favourite resting-place, and shortly afterwards he ventured quite out of the water, and took up his original abode. After this our first interview, I found him daily occupying the same place; and in order to improve our acquaintance, I treated him regularly to a sun-fish breakfast. When our daily intercourse had continued for some weeks, I determined upon taking him prisoner. For this purpose I baited a large hook with a sun-fish, which I threw towards him; and the poor frog, unconscious of any harm, seized it with his usual avidity, when I struck the line somewhat smartly, and found that I had hooked him. I then drew him gently towards me, and, after some fruitless resistance on his part, hauled him into my skiff. He seemed dreadfully alarmed on my laying hold of him, in order to relieve him from the hook and fish, which he had nearly swallowed; and having performed the operation without paining him more than necessary, and having detained him for half an hour, I then permitted him to plunge into his native element.

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* Rana esculenta.

† Rana mugiens: Catesby.

"I supposed that our acquaintance would probably end here, but no such thing; for on the following morning, when I repaired to my fishing-ground, I found him at his wonted station. I fed him daily as before, and could perceive that he allowed me to approach him much closer, without exhibiting the degree of alarm he had done at first. I one day *tied* a fish to the line without any hook, and after he had laid hold of it, pulled him quietly into the boat, when he struggled violently, ejected the fish from his stomach, leaped overboard, and swam to his place of refuge. Our intercourse after this became daily more familiar; so that, in the lapse of a few weeks, he would mount upon the flat part of an oar, when I held it close to him, and alight from it in the opposite end of the skiff from where I sat. Thither I would throw him a small sun-fish or two, which he quickly disposed of; after which he would jump overboard, or again mount the flat part of the oar, in order to be handed back to his resting-place. Soon after this, he would take his accustomed allowance from my hand; at last permitted me to handle him gently, still, however, exhibiting some degree of timidity. After this, I took him across the lake, and confined him in a hogshead, open at both ends, which I placed near the shore, where the water was only about a foot deep. In the centre of the hogshead I placed a stone for him to perch upon, which arose just above the surface of the water. He remained a few days in this confinement, eating from my hand, until one day I found him missing, and concluded he had been devoured by a minx or an otter. But on examining the shore for a short distance, I discovered him perched on a decaying log, close to the water's edge. On calling him by the name (Ralph) to which I had lately accustomed him, I thought that he recognised my voice immediately. I took him in my hand without his attempting to escape, and returned him to his solitary abode. The next morning he again was missing, when I went in search, and found him near the same place as before. I now determined to watch his mode of escaping, for which purpose I hid myself in the bushes close by. I had remained there but a few minutes when I saw him spring clean over the upper edge of the hogshead into the water. The fact was this, that, from his great muscular strength and agility, he was able, at a single effort, to leap fairly over the top of the cask, which was three feet perpendicular above the top of his supporting stone. On discovering this, I removed the stone, and in its place gave him a floating piece of wood to perch upon, which I found to answer my purpose completely; for upon his making a spring, the perch gave way under the effort; he thereby lost his balance, and all his attempts were unavailing. Having satisfied myself of the practicability of making a domestic pet of a wild bull-frog, I made a present of Ralph to the daughter of a friend of mine, who promised to be kind to him, and to have all his wants cared for. But I afterwards understood that the lake had been visited by a tremendous storm, which had overturned Ralph's prison-house, when, of course, he escaped; but whither, or what became of him, no one could ever tell.

"A friend of mine, who lived close to the outlet of a small lake, within a few miles of the scene of Ralph's adventures, used to bestow a great deal of care and attention upon the rearing of young ducklings; but, after all, had the mortification to find his efforts fruitless. The old ones would hatch fine healthy broods; but as soon as they were strong enough to waddle to a sedgy stream that issued from the adjoining lake, one or two daily disappeared, to the great annoyance of my friend. Having suffered those continual depredations for two or three seasons, he one day witnessed a nice duckling gradually disappear under the water; but judge of his surprise when he beheld a huge bull-frog crawl out upon the prostrate trunk of a tree, with the duckling's feet still protruding from his capacious mouth! The mystery was thus solved; the bull-frogs had swallowed all my friend's young ducks."

Of all reptiles we should least expect to find frogs of arboreal habits; and yet, there is a numerous group * expressly adapted to their leafy abodes. The monkey, as we know, grasps with its paws the perch whereon it rests; the same thing is done by the bird with its claws; the snake twines itself around the branch; the Iguana uses its long toes and hooked nails; and the chameleon holds the bough tight between its toes, as if they formed a vice. But the foot of the Tree-frog is provided with suckers, resembling those of the Geckos; and in this respect it is unlike that of the common species. On the under surface of each finger, so to speak, both of the fore and hind paws, and at the tip, which is enlarged and rounded, is placed a sucker, consisting of a little cushion, moist with a thick glutinous fluid, and applying itself so closely to the surface it touches, as to support the creature's weight. So completely, however, is this curious mechanism under the tree-frog's control, that it can detach or fix its fingers at will. The tree-frogs are beautiful creatures, both in form and colouring, and their habits give them additional interest. They perch upon the leaves; they leap from leaf to leaf, and from branch to branch, and imitate the actions of a bird. Then they pursue their insect prey with astonishing agility, and enjoy the cheering warmth of summer. The tree-frogs differ from others, not only in the structure of their feet, but in the greater length of the hind legs, and in the circumstance of the males possessing a membranous sac beneath the throat, which is distended while uttering their hoarse and oft-repeated croaking. The genus is spread over the warmer portions of the old and the new world.

THE COMMON TREE-FROG.†

This creature, which is one of the most interesting and beautiful of the group, is a native of Europe. It is very common in Sardinia, and it is not unfrequent in other portions of the south and south-eastern districts; it is also found in Northern Africa.

The vigour and agility which distinguish the common frog are qualities still more remarkable in this curious little creature, which is as far inferior in size to its terrestrial relative, as it excels it in the beauty and clearness of its colouring. The upper surface of the body is of a fine green; the under surface white; a yellow stripe, bordered with pale violet, stretches along the sides of the head and body, and down the hind legs to the feet; while a similar stripe branches off and extends down the arms to the fore feet. The head is short, but large; the muzzle is rounded; the eyes are bold and prominent; the body is short, and of a triangular figure; the toes of the paws, or anterior feet, are four in number, short, and stout; those of the hind feet are five, and are long and slender; the interdigital webs are only partially developed; the hinder limbs are long.

The alertness and agility displayed by the tree frog are truly astonishing. Catesby states that it has been known to clear an interval of twelve feet. It is in the midst of the woods, and among the foliage and branches of the trees, that this reptile passes the greater part of the summer. So adhesive are the gelatinous cushions of its toes, that however smooth and polished the surfaces may be, they attach themselves to them firmly; nor does it matter whether any surface is upper or under, for on either the tree frog is perfectly secure.

In the warm and sunny regions of the south, this little creature may be watched, during the summer, among the leafy woods, engaged in pursuing various insects, darting after them as they pass within the distance of its spring; it seizes them with its glutinous tongue, and rapidly draws them into its mouth, in the same manner as the common frog; and having swallowed one insect, it darts at the next that attempts to flit by.

This restless activity, this unceasing repetition of leaps, not unlike the short-darting flights of a

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* Hyla.

† Hyla arborea.

bird from leaf to leaf, or from bough to bough, have induced some to compare it to one of the fly-catchers,* which takes gnats and flies much in the same manner, by an abrupt attack on such as pass near its post of observation.

Lacépède truly affirms that the unfavourable opinions which many very foolishly entertain with regard to the common frog, will not be brought against this little favourite. "Its fine tints, which blend with the green of the leaves and the enamel of the flowers, at once give it interest; but when we watch its stratagems and ambuscades; when we mark it choosing its tiny prey; when we see it dart to the distance of many feet, pitch upon the leaves, and in whatsoever situation they may hang, there adhere and settle in a way which, did we not know the secret, would appear marvellous—are we not as much pleased and delighted in our observations of so novel and unexpected a train of actions, as in a consideration of the plumage, the manœuvres, and the flight of birds?"

THE COMMON TREE-FROG.

The tree-frog, like the rest of its race, commences its existence as an aquatic animal; and when adult it visits the water to deposit its eggs: it also hybernates in the mud, at the bottom of lakes and marshes.

Towards the end of April the tree frog quits its leafy abode, in order to deposit its eggs in the water of the neighbouring marsh; for it is in the proximity of such places that these animals are the most abundant. Numbers are now collected for the same purpose, the males being conspicuous by the distention of their throat, which assumes a tint of brown, and by their loud hoarse croakings, which exceed in vehemence those of the notes of the common frog. The first croak uttered is the signal for a union of discordant voices. So astounding is the clamour, that, at a distance, it might be taken for the cry of a pack of hounds in full chase; and during the tranquillity of a calm evening, or in the stillness of night, their combined voices may be frequently heard at the distance of a league, especially on the approach of rain. After the breeding season the tree frog becomes of a reddish brown, which soon changes to gray, mottled with reddish; the colour next assumed is blue, and this again changes to green, which is the summer tint. After the young are hatched, as is the case of the common frog, by the heat of the sun, they remain in their tadpole state for about two months, swimming in their native element, and devouring small insects and worms. When the tail and gills have disappeared, and the lungs and limbs are developed, the little creatures, full of activity, and guided by unerring instinct, leave the water, and make their way to the adjacent woods, there to join their parents among the foliage. Swarms of these young frogs are occasionally seen, leaping, like flocks of minute birds, among the bushes and trees which border the lakes and marshes of their favourite districts. The tree frog does not attain its full growth till the fourth year; nor does it breed till this period arrives.

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* Muscicapa grisola.

At the close of summer and the setting in of autumn, this little creature, warned by the failure of its insect food, and the chilliness of the atmosphere, prepares for its winter repose. Unlike the bird, which it imitates in its arboreal habits, it cannot migrate to a hotter or more southern clime; but like the common frog, and various other amphibia, it hybernates; not suspended from the trees, or in holes as the bat; nor in little warm nests, like the dormouse; but in the deep mud of the marsh or lake. To the water then, a second time, does the tree frog retire: in it plunges, and buries itself in the soft mud at the bottom; when it gradually sinks into a state of torpor, in which the functions of life are suspended. Thus the winter months are passed, till spring returns, and reanimates the face of nature; then it again makes its appearance, and seeks the fresh foliage of the trees.

The beautiful colours and great sprightliness of the tree frogs have led to their being kept in cages, suspended in rooms, like goldfinches and canaries. Nor is there much difficulty in keeping them, provided the temperature be suitable and there be a due supply of natural food. After death, the grain of the upper surface is frequently observed to change into blue. The genus *Hyla*, it may be remarked, contains a very large variety of species, among which, so far as known, a similarity of habit prevails.

Cuvier distinguishes toads as having an inflated body, the skin warty or tuberculous, and a tumour of variable size behind each eye, consisting of a gland, from the pores of which exude an unctuous and offensive fluid. There are no teeth: the hind limbs do not much exceed in length the fore pair. They crawl rather than leap, and when their transformation from the tadpole state is accomplished, they retire from the neighbourhood of the water to dry situations. Their saliva is popularly supposed to be venomous, but this is one of many common errors.

THE COMMON TOAD.*

THIS creature is very well known. The poet says: "It wears a precious jewel in its head," alluding to the brilliancy of its eyes. Glands appear on the skin of the back and sides, which pour out an acrid fluid, capable, perhaps, of producing irritation on a very sensitive skin, and certainly designed as a means of defence. A dog, seizing a toad, immediately drops it; its mouth becomes rapidly filled with an abundance of frothy saliva, while its attempts to clear it away, and its mode of shaking its head, prove its mouth to be unpleasantly or painfully affected.

Toads are easily rendered familiar; and in a little time they will come out of their holes, and sit quietly to take small slugs presented to them. This they do like the frog, and with so rapid an action of the tongue as almost to elude the eye. A friend of the writer's had once a small colony of toads tenanting the rough wall of an old terraced garden; they would put their heads and half their bodies out of their hiding-places, and receive their food in the most familiar manner. Slugs were thus regularly given them for two summers. Mr. Bell had a tame toad, that would sit on one hand, and eat from the other.

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* Bufo vulgaris

THE NATTER JACK TOAD.*

This animal, living also in our island, is very common in certain localities. It is found on Blackheath, and about Deptford, in various places about Cambridge and Norfolk, on the coast of Solway Frith, and in various other places. It is abundant in Germany and France. Its colour is of a yellowish or olive brown, with a bright yellow line along the middle of its back. Dry spots are its favourite haunts; but the water is its breeding place. It is less sluggish and croaking in its nature than the common toad, and will even run, though very awkwardly, for a short distance.

That frogs, toads, snakes, and lizards occasionally issue from stones that are broken in a quarry, or in sinking wells, and even from a strata of coal at the bottom of a coal mine may be readily admitted; but Dr. Buckland remarked that "the evidence is not perfect to show that the reptiles were entirely inclosed in a solid rock; no examination is ever made, until the reptile is first discovered by the breaking of the mass in which it was contained, and then it is too late to ascertain, without carefully replacing every fragment (and in no case that I have seen reported has this ever been done), whether or not there was any hole or crevice by which any animal may have entered the cavity from which it was extracted. Without previous examination, it is almost impossible to prove that there was no such communication. In the case of rocks near the surface of the earth, and in stone quarries, reptiles find ready admission to holes and fissures. We have a notorious example of this kind in the lizard found alive in a chalk-pit, and brought alive to the late Dr. Clarke."

THE COMMON TOAD.

The first effort of the young toad, as soon as it has left its tadpole state and emerged from the water, is, doubtless, to shelter in holes and crevices of rocks and trees. An individual, which, when young, may then have entered a cavity by some very narrow aperture, would find abundance of food by catching insects, which, like itself, seek shelter within such cavities, and may have soon increased so much in bulk as to render it impossible to go out again through the narrow aperture at which it entered. A small hole of this kind is very likely to be overlooked by the workmen, who are the only people whose operations on wood and stone disclose cavities in the interior of such substances.

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* Bufo calamita

Dr. Buckland made some experiments on this subject, which he commenced in November, 1825. He caused twelve circular cells to be prepared in a large block of coarse oolitic limestone, from Heddington Quarry, near Oxford. Each cell was about one foot deep, and five inches in diameter, and had a groove or shoulder in its upper margin, fitted to receive a circular plate of glass, and a circular slate to protect the glass; the margin of this double cover was closed round, and rendered impenetrable to air and water by a luting of soft clay.

Another block of compact siliceous sandstone was made to contain twelve smaller cells, each six inches deep and five inches in diameter, and each under the same double cover as the first-mentioned cells. A live toad was placed in each of these twenty-four cells on the 16th of November, and the double cover of glass and slate was placed over each of them, and cemented down by a coating of clay. Dr. Daubeny and Mr. Dillwyn, who were present, ascertained and noted the weight of each toad (they had all been imprisoned together in a cucumber frame, some of them two months previously), as it was immersed. The largest weighed 1,185 grains; the smallest 115 grains; and they were distributed equally, small and large, among the limestone and sandstone cells. The blocks were buried in the earth of Dr. Burke's garden, three feet deep.

On the 10th of December, 1826, these blocks, which had remained unopened from the period of their inhumation, were examined. Every toad in the smaller cells of the sandstone block was dead, and so much decayed that they must have been dead for some months. The greater part of those in the larger cells of the oolitic block were alive. No. 1, which weighed when placed in the cell 924 grains, was reduced to 698 grains. No. 5, whose weight at the same period was 1,185 grains, had increased, it is asserted, to 1,265 grains. Dr. Buckland observes that the glass over this toad's cell was slightly cracked, so that minute insects might have entered; but none were discovered therein. In another cell, the glass of which was broken, and its tenant dead, there was a large assemblage of minute insects; and a similar assemblage was observed also on the outside of the glass of a third cell. In the cell No. 9, a toad which weighed at its entrance 988 grains, had increased to 1,116 grains. The glass cover of this cell was entire, but the coating which was designed to secure it was not attentively examined; and Dr. Buckland observes, that it is probable there was some aperture by which small insects found admission. No. 11 had decreased from 936 to 652 grains.

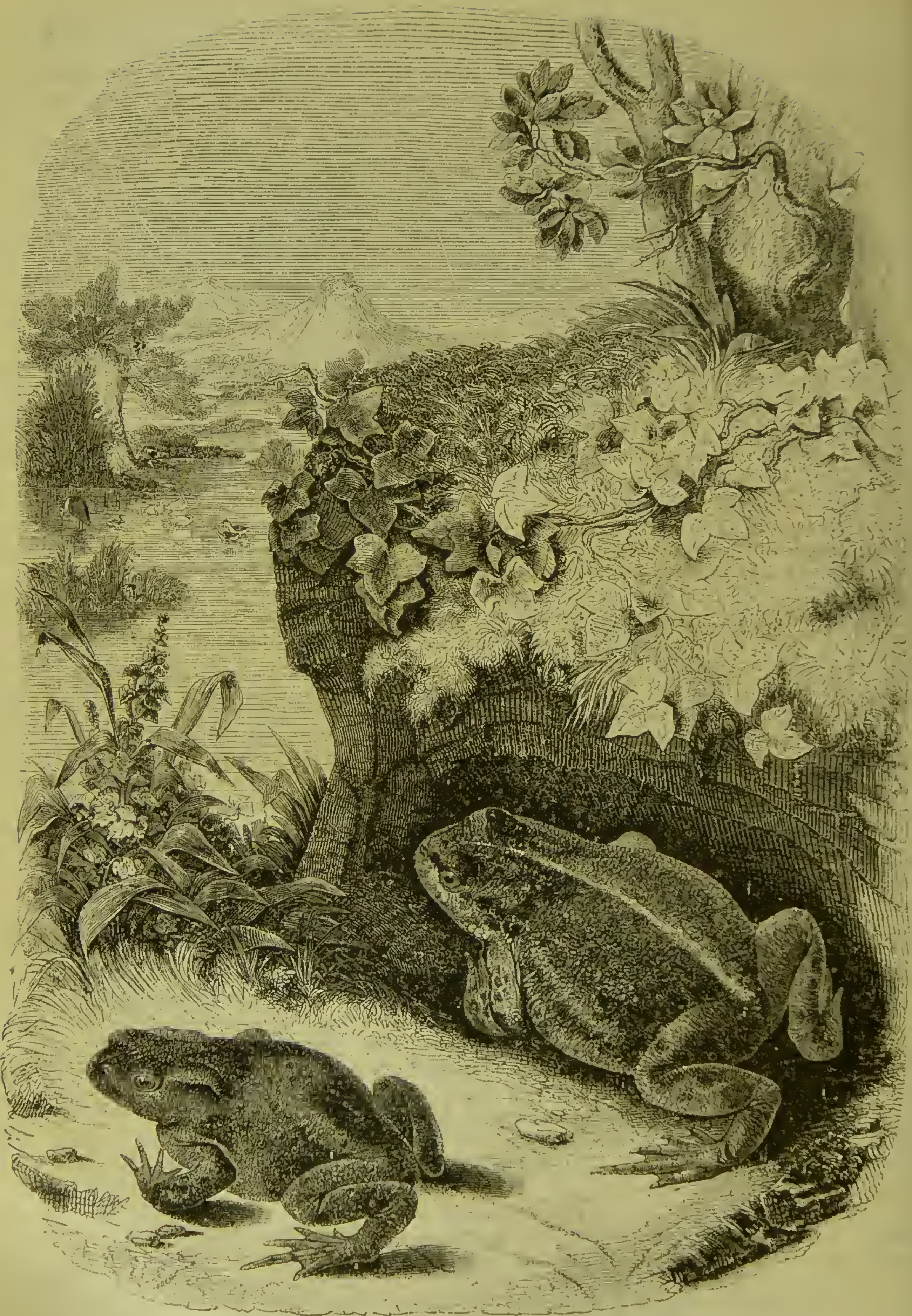
The result of Dr. Buckland's experiments was, that all the toads, both large and small, inclosed in sandstone, and the small toads in the limestone, were dead at the end of thirteen months—a fate which befell all the large ones also, before the expiration of the second year. These last were examined several times during the second year, through the glass covers of their cells, but without removing them to admit air; they appeared always awake, with open eyes, and never in a state of torpor; but at each successive examination they became more and more meagre, till at last they were found dead. The two toads which, when first examined, had increased in weight, and were at the end of the first year carefully closed up again, were not exempt from the common destruction, but were emaciated and dead before the expiration of the second year.

When Dr. Buckland inclosed these toads in stone, he, at the same time, placed four other toads, of moderate size, in three holes, cut for that purpose, on the north side of the trunk of an apple-tree. Two were placed in the largest cell, and each of the others in a single cell, the cells being nearly circular, about five inches deep, and three in diameter. These were carefully closed with plugs of wood, so as to exclude access of insects, and were apparently air-tight. Every one of the toads thus "pegged" in the knotty entrails of the tree was found dead and decayed at the end of the first year.

Four toads were, at the time the others were shut up, each placed in a small basin of plaster of Paris, four inches deep and five inches in diameter, having a cover of the same material luted over them; these were buried at the same time and in the same place with the blocks of stone, and on being examined at the same time with them, in December, 1826, two of the toads were dead and the other two alive, but greatly emaciated.

Dr. Buckland concluded, from the experiments generally, that toads cannot live a year excluded totally from atmospheric air; and from the experiments made in the larger cells of the oolite, that there is a probability that these animals cannot survive two years entirely excluded from food.

The eggs of amphibia are enveloped in a sort of delicate, mucous, permeable membrane; they are, when excluded, most frequently agglomerated, either in glutinous masses or chaplets, and increase



THE COMMON TOAD.　　THE NATTER JACK TOAD.

considerably after they are plunged in the water. There are, however, some curious modifications of the disposition of the eggs in certain species. In one species of toad* the male, after the exclusion of the eggs, takes up the chaplets, and disposes them around his thighs, something in the form of a figure of eight. He is then said to carry them about till the eyes are visible. At the proper period for hatching he conveys his progeny to some stagnant piece of water, and deposits them, when the eggs break, and the tadpoles come forth and swim about.

THE FEMALE PIPA.

There is a toad in Surinam, Guiana, and Brazil (the Pipa), which manages its eggs in a different manner. As the female produces them, the male spreads them over her flat and broad back. When this is effected, the skin of the back suffers a sort of inflammatory action; numerous pustules, or rather pit-margins, arise, which seem to absorb the eggs, one in each pit, so that the entire back resembles a portion of honeycomb. Here, the eggs are duly hatched, and, what is more extraordinary, here the tadpoles undergo their transformation, and become complete, emerging as their development takes place, which is not precisely at the same period of time. The average interval, however, from the spreading of the eggs on the back of the female, is eighty-two days. In a short time the skin of the back regains its usual appearance. The young, when they quit the cells of the parent, are very small, not exceeding a lentil in size; but their limbs are perfectly well formed.

The toad, like all the reptiles and amphibia, yearly sheds its cuticle or scarf-skin; a new one, of brighter tints, being prepared beneath. Mr. Bell has described the way in which this process take place. "Having often found," he says, "among several toads, which I was then keeping for the purpose of observing their habits, some of brighter colours than usual, and with the surface moist and very smooth, I had supposed that this appearance might have depended on the state of the animal's health, or the influence of some peculiarity in one or other of its functions.

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* Bufo obstetricans.

"On watching carefully, however, I one day observed a large one, the skin of which was particularly dry and dull in its colours, with a bright streak down the mesial line of the back; and, on examining farther, I observed a corresponding line along the belly. This proved to arise from an entire slit in the old cuticle, which exposed to view the new and brighter cuticle beneath. Finding, therefore, what was about to happen, I watched the whole detail of this curious process. I soon observed that the two halves of the skin, thus completely divided, continued to recede farther and farther from the centre, and became folded and wrinkled; and after a short space, by means of the continued twitching of the animal's body, it was brought down in folds at the sides. The hinder leg, first on one side, then on the other, was brought forward under the arm, which was pressed down upon it, and, the hinder limb being withdrawn, its cuticle was left inverted under the arm. That of the anterior extremity was then loosened, and at length drawn off by the assistance of the mouth. The whole cuticle was thus detached, and was now pushed by the hands into the mouth, rolled in the form of a little ball, and swallowed at a single gulp."

NEWTS.

THESE creatures are sometimes called Efts—some species being terrestrial, and visiting the water only during the breeding season, while others make it their permanent, or nearly constant, abode. Their tadpoles undergo a transformation, resembling, in all essential particulars, that of the tadpoles of the frog, with this exception, that the tail merely changes its form, and is never lost.

Of another group* the characteristics are as follow: head thick; eyes large; gape of the mouth ample; tongue broad; palatine teeth arranged in two long series; parotids large; body sprinkled with many glands; toes free; tail rather smooth.

THE SPOTTED SALAMANDER.†

THIS creature, inhabiting Central Europe and the mountainous parts of the south of Europe, is black with yellow spots, and has numerous prominent warty excrescences on the sides, and the tongue very large.

The body of the salamander is largely covered with warty glands, which secrete a milky fluid, of a glutinous and acrid nature, like that of the toad, which, if not capable of affecting the larger and more highly organised animals, appears to be a destructive agent to those of lesser power. Thus Laurenti provoked two gray lizards to bite a salamander, which at first attempted to escape from them, but, being still persecuted, agitated some of this fluid into their mouths. One of the lizards died instantly, and the other fell into convulsions for two minutes and then expired. Some of this juice was introduced into the mouth of another lizard; it became convulsed, was paralytic on the whole of one side, and soon died.

Such is the only foundation for the notion so long cherished that the salamander was one of the most venomous of animals. Nicander, in his "Alexipharmica," gives an appalling instance of the symptoms produced by its bite. The Romans looked on it with horror as most destructive, and considered it as deadly as hemlock or aconite. Hence a proverb arose that he who was bitten by a salamander had need of as many physicians as the creature had spots; while another was, "If a salamander bites you, put on your shroud."

But the chief absurdity was the belief that this creature was incombustible—that it not only resisted the action of fire, but extinguished it, and, when it saw the flame, charged it as an enemy which it knew well how to vanquish. Even so late as 1789, M. Pothonier, the French consul at Rhodes, relates that, while sitting in his chamber there, he heard a loud cry in his kitchen, whither he ran, and found his cook in a horrible fright, who informed him that he had seen the devil in the fire. M. Pothonier then states that he looked into a bright fire, and there saw a little animal, with open mouth and palpitating

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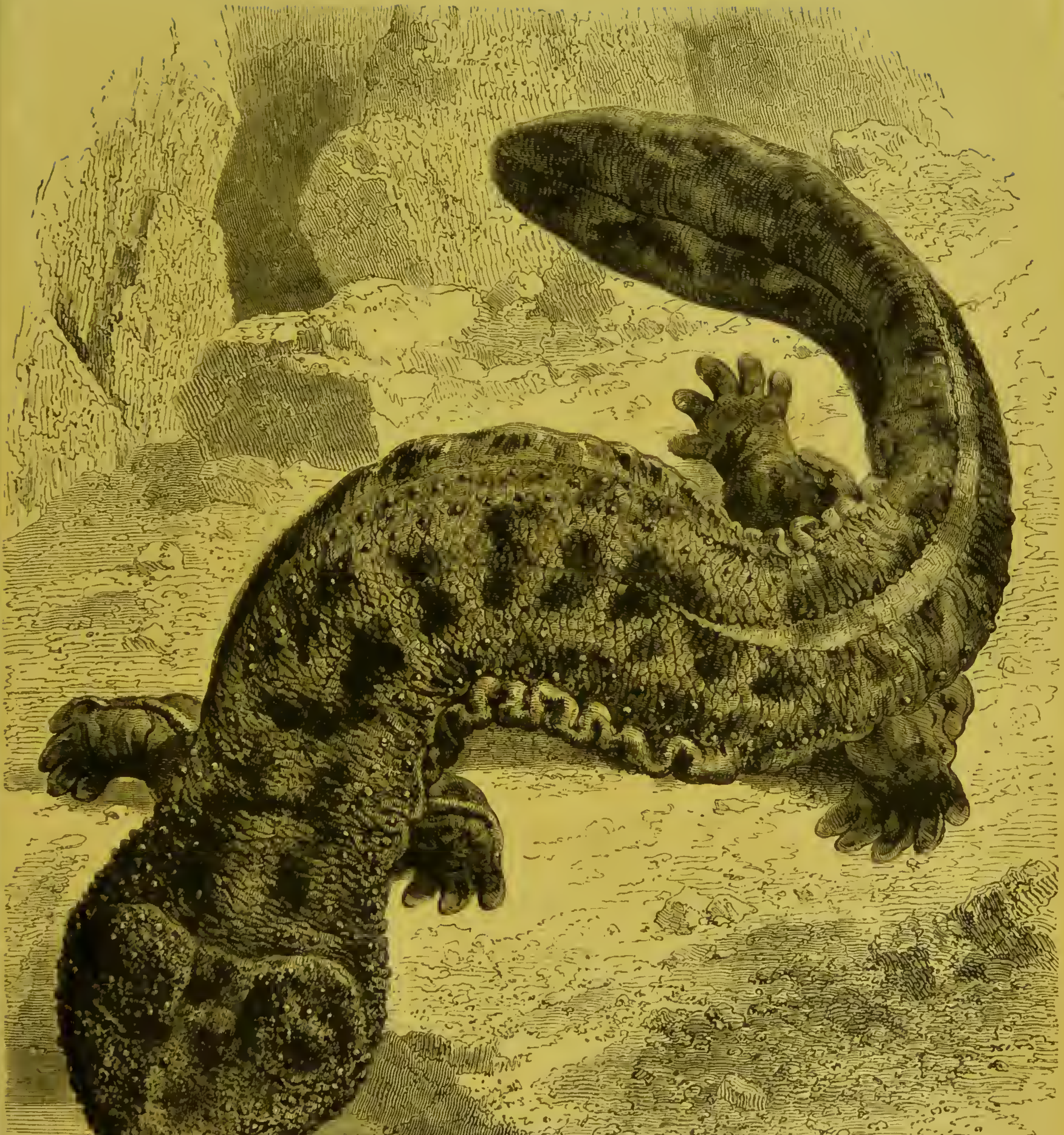
* Salamandra.

† S. maculosa.



THE GREAT JAPANESE SALAMANDER.

throat. He took the tongs, and endeavoured to secure it. At his first attempt the creature, which, he says, had been motionless up to that time two or three minutes, ran into a corner of the chimney, having lost the tip of its tail in escaping, and buried itself in a heap of hot ashes. In his second attempt the consul was successful, drew the animal out, which he describes as a small lizard, plunged it into spirits of wine, and gave it to Buffon. M. Pothonier was, doubtless, strongly under the influence of preconceived notions.

A cloth said to be made of the skins of salamanders was declared to be incombustible; but even Marco Polo was shrewd enough to observe that such fabrics were really made of a mineral substance since well known as asbestos. The old writers termed this "salamander's wool;" and such was probably the salamander cloth sent by the Tartar king to the Roman pontiff, in which the so-called "holy napkin," *Sudarium Domini*, is preserved.

The salamander undergoes the same changes as the frog from the tadpole state. It differs much, however, as to the development of particular parts of the skeleton. The anterior extremities make their appearance earlier than the hind legs, and the tail remains as a permanent part of the structure. The rudimental ribs are exceedingly small, and the sternum continues cartilaginous. The pelvis has no osseous connection with the spine, but is merely suspended to it by ligaments. The land salamanders have a rounded tail, but the aquatic species have it compressed vertically—thus retaining the fish-like form of the tadpole, and the same radiated disposition of the muscles. The salamander lizard, of which an engraving appears at page 42, is a creature of this kind. Some of these animals may be seen in the python house of the Zoological Gardens; but the most remarkable of them all is the Gigantic Salamander,* a native of the Isle of Niphon, in the empire of Japan. It inhabits the lakes and streams of the volcanic range of mountains in the interior, and is the largest species of amphibia now known to exist.

TRITON VITTATUS.

AQUATIC NEWTS.†

THESE animals, sometimes called Tritons, are distinguished by the tail being always flat at the sides, and by the absence of parotid glands on the sides of the head. The body is covered with warty

* Sieboldia maxima.

† Triton.

tubercles. These reptiles pass almost their entire existence in the water. The males are distinguishable, during the breeding season, by a high membranous ridge along the back, and a second along the upper ridge of the tail; these crests subsequently diminish. The limbs are short and feeble, and the Newts move in the waters by the paddle-like action of the tail.

THE COMMON WATER NEWT.[*]

THIS species, about six inches in length, frequents deep ditches in moist meadows, and large pools. It feeds on aquatic insects, the tadpoles of the frog, and even the smaller species of water newts, which it seizes and holds fast, with determined ferocity. Early in the spring the crests of the male become expanded, and that of the back deeply notched at its edge.

"The female," observes Mr. Bell, "selecting some leaf of an aquatic plant, sits, as it were, upon its edge, and folding it by means of her two hinder feet, deposits a single egg in the duplication of the folded part of the leaf, which is thereby glued most securely together, and the egg is thus effectually protected from injury. The manner in which this is effected is highly interesting; and may readily be observed by any one, as the animals are sufficiently common in many ponds and ditches, and may generally be easily obtained by means of a minnow net. In the neighbourhood of London especially they are to be found in numbers every spring, and I have had no difficulty in procuring as many as I wished for the purposes of observation." In the months of May and June the female deposits her eggs; in due time these are hatched, and the tadpoles, with fringed gills, swim actively about. Towards the close of autumn they lose their gills and their fish-like appearance, and acquire their perfect condition. They soon prepare to hybernate, and remain torpid during the winter, buried in the soft mud below the water. Among the various species of Newt, four others only can now be mentioned: the Triton Vittatus, the Straight-Lipped Water Newt,[†] the Smooth Newt,[‡] and the Palmated Smooth Newt.[§]

Such, then, are the illustrations we give of one great division of the Amphibia;[||] another remains to be briefly noticed.[¶] These reptiles, though they acquire lungs, do not lose the gills, or branchial fringes; continuing, as it were, permanently in a tadpole state, by an arrest of further development.

The term amphibious, taken in its strict and literal sense, would apply only to such animals as have the power of living indifferently at the same time, either upon land or in water. It is necessary, therefore, that a truly amphibious animal should be provided with the means of breathing in either of these elements; that is, that it should simultaneously possess both lungs and gills: and of these there are many examples.

The first genus to be noticed is that termed Proteus, of which one species is known.

THE PROTEUS.[**]

THE branchiæ of this animal are not covered as in fishes, but are exposed, and form a beautiful pink-coloured tuft on each side of the head. The body is eel-like, as are its movements; the tail is compressed; the eyes are rudimentary beneath the skin; the jaws are furnished with minute teeth. The limbs are very small and feeble, and almost useless; the toes before are three; and there are two in each limb behind. The skin is smooth and delicate.

The abode of the Proteus is very remarkable. It is a dweller in subterranean water, where no ray of light penetrates: light, indeed, is too high a stimulus for the eyes of the creature to bear with comfort; and hence they are merely small dots beneath the skin, and in the lowest rudimentary condition. It is found only in one limited district. At Adelsburg, in the Duchy of Carniola belonging to Austria, there is one of the most splendid caverns in Europe; it is commonly known by the name of the Grotto of the Maddalena.

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[*] T. cristatus: Gray.

[†] Triton Bibronii: Bell.

[‡] Lissitriton punctatus: Bell.

[§] L. palmipes.

[||] Cadubranchiate Amphibia.

[¶] Pennibranchiate Amphibia.

[**] Proteus anguinus.

The whole of this part of the country consists of bold rocks and mountains, of limestone formation, full of subterranean caverns, containing lakes and vast reservoirs of water, hundreds of feet beneath the surface, whence many rivers take their secret origin. These subterranean waters communicate with and supply a small lake in the celebrated cavern now alluded to; and it is in this lake, where the sun never enters, inclosed by barriers of piled-up rock, deep in the bowels of the earth, that the proteus is found reposing on the soft mud, precipitated by the fluid, and lining the rocky basin. It has also, though rarely, been noticed at Sittich, about thirty miles distant, thrown up by water from a subterraneous cavity.

The waters of the cavern at Adelsburg must not, however, be supposed to teem with these animals; their occurrence is uncertain (for they are not bred there), and depends on casual circumstances. According to Sir H. Davy, "they are seldom found in dry seasons, but after great rains they are often abundant;" and he adds, "I think it cannot be doubted that their natural residence is in an extensive, deep, subterranean lake, from which, in great floods, they sometimes are forced through the crevices of rocks into this place, where they are found; and it does not appear to me impossible, when the peculiar nature of the country is considered, that the same great cavity may furnish the individuals that have been found at Adelsburg and Sittich." In his "Consolations in Travel," the following conversation arises on this statement:—

"That is a very extraordinary view of the subject. Is it not possible that the proteus may be the larva of some large unknown animal inhabiting these limestone cavities? Its feet are not in harmony with the rest of its organisation, and were they removed it would have all the characters of a fish."

"*The Unknown.*—I cannot suppose that they are larvæ. There is, I believe, in nature no instance of a transition, by this species of metamorphosis, from a more perfect to a less perfect animal. The tadpole has a resemblance to a fish before it becomes a frog; the caterpillar and the maggot gain not only more perfect powers of motion on the earth in their new state, but acquire organs by which they inhabit a new element. This animal, I dare say, is much larger than we now see it, when mature in its native place; but its comparative anatomy is exceedingly hostile to the idea that it is an animal in a state of transition. It has been found of various sizes, from that of the thickness of a quill to that of the thumb, but its form of organs have been always the same. It is surely a perfect animal of a peculiar species; and it adds one instance more to the number already known of the wonderful manner in which life is produced and perpetuated in every part of our globe, even in places which seem the least suited to organised existences. And the same infinite power and wisdom which has fitted the camel and the ostrich for the deserts of Africa, the swallow that secretes its own nest for the caves of Java, the whale for the Polar seas, and the morse and white bear for the Arctic ice, has given the proteus to the deep and dark subterraneous lakes of Illyria—an animal to whom the presence of light is not essential, and who can live indifferently in air and in water, on the surface of the rock, or in the depths of the mud."

"*Phil.*—It is now ten years since I first visited this spot. I was exceedingly anxious to see the proteus, and came here with the guide in the evening of the day I arrived at Adelsburg; but, though we examined the bottom of the cave with the greatest care, we could find no specimens. We returned the next morning and were more fortunate, for we discovered five close to the bank, on the mud covering the bottom of the lake; the mud was smooth and perfectly undisturbed, and the water quite clear. This fact of their appearance during the night seemed to me so extraordinary, that I could hardly avoid the fancy that they were new creations. I saw no cavities through which they could have entered, and the undisturbed state of the lake seemed to give weight to my notion. My reveries became discursive. I was carried in imagination back to the primitive state of the globe, when the great animals of the sauri kind were created under the pressure of a heavy atmosphere; and my notion on this subject was not destroyed, when I heard from a celebrated anatomist, to whom I sent the specimens I had collected, that the organisation of the spine of the proteus was analogous to that of one of the sauri, the remains of which are found in the older secondary strata."

The length of a specimen of moderate size is about a foot; the tail is compressed laterally, like that of an eel, and is used in the same manner as in swimming. The head is elongated and depressed; the mouth is wide, and furnished with numerous teeth, whence it may be concluded that the animal is carnivorous in its propensities.

Some of these animals, however, have been kept for months in a vessel of water, without apparent food, and in perfect health and vigour. The skin is of a pale flesh colour; but when the proteus is removed from its native situation, and exposed to light, it assumes a darker tint, approaching olive brown, and the branchial tufts become deeper. But the light is evidently distressing, and the animals are glad to creep beneath the shelter of any substance that may be near.

In another genus,* the body is moderately elongated; the tail deep, and flattened at the sides; the head flat, and the branchial tufts large.

THE AXOLOTL.†

At the period of the Mexican conquest, the Spaniards found this animal in great abundance in the lake which surrounded the city of Mexico, to the inhabitants of which capital it then furnished, as it still continues to furnish to their successors, an agreeable and much-esteemed article of food. When full grown, it measures about eight or nine inches in length; its ground colour is a uniform deep brown, thickly mottled both on the upper and under surfaces of the head and body, as well as the limbs, tail, and dorsal and caudal fins, with numerous small, round, black spots.

THE SIRENS.

We have now arrived at the last genus‡ of reptiles, in which there are several species. One of these§ grows to the length of three feet; its colour is blackish. The feet have four toes, and the tail is compressed into an obtuse fin.

This siren inhabits the marshy grounds of Carolina, especially those where rice is cultivated. It lives in the mud, from whence it makes excursions, sometimes on land, and sometimes in the water. Its food is generally supposed to consist of insects, earth-worms, &c. Specimens have occasionally been kept in the Zoological Gardens. One of these was twenty inches long, as large as the wrist of a stout child six months old, and very eel-like in its appearance and movements. It was kept in a vessel of pond-water, with a deep bottom of mud, in which it used to hide itself. About a dozen and a half of earth-worms were supplied to it as food every other day.

Dr. Patrick Neill, of Edinburgh, possessed one of these creatures. It measured one foot five inches in length, and about four inches in circumference. Its colour was deep blackish-brown, rather paler beneath, where it was partially tinged with a bluish hue; and marked all over with numerous small, irregular, pale, ashy-brown spots, not very perceptible, except on a rather close inspection. The gills consisted of three fleshy peduncles, which increased in size from the first to the last. They were beautifully branched from beneath, and along their lateral and terminal edges; and these little branches were divided and sub-divided into still more minute ramifications. This elegant fringe-work formed the true gills; the central and fleshy stalks serving merely as their support. Beneath, and rather in advance of these bodies, were three vertical clefts, through which the water was ejected backwards from the interior of the mouth upon the gills, though with a much more languid and less perceptible action than in fishes.

The general surface of this siren was very smooth, and no scales were apparent to the naked eye. Towards the tail its form became thin and compressed, and that part was margined for several inches —both above and below, as well as around its terminal point—by a narrow membrane or fin, which, no doubt, greatly aided its movements through the water.

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* Menobranchus.

† M. pisciformis: Harlan.

‡ Siren.

§ S. lacertina.

FISHES.

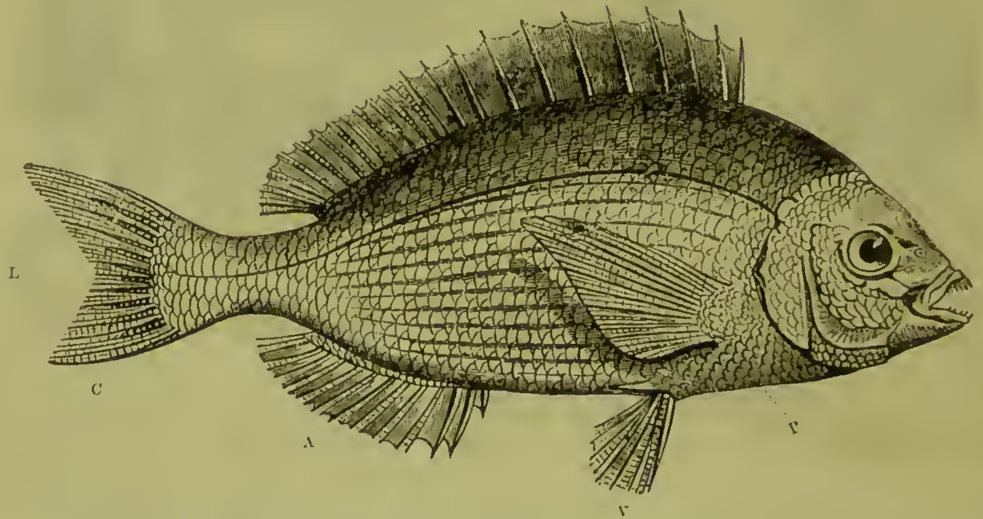
Fish is a name applied to all the species of a class of animals occupying the lowest station of the four great divisions of the section *Vertebrata*. A fish may, therefore, be defined a vertebrate animal, breathing through the medium of water, by means of branchiæ, or gills, having one auricle and one ventricle to the heart, cold red blood, and extremities formed for swimming.

The breathing apparatus is situated on each side of the neck, and consists of numerous laminæ, fixed on arches. These laminæ are covered with innumerable blood-vessels, and are so constructed as to present a considerable surface to the water, so that the blood may receive a sufficient portion of the oxygen contained in that element. As the water in contact with the gills becomes deteriorated, it is necessary that a constant current be caused to flow over them. In most fishes this is constantly effected by their taking the water in at the mouth and expelling it from under the gill-covers. The blood, which is sent to the branchiæ from the heart, is distributed by means of the arteries to every part of the body, whence it returns to the heart by means of the veins.

Every other part of the structure is equally well adapted to aquatic habits. The body is generally of an elongate, oval, compressed form, covered with scales directed backwards, and furnished with fins; thus being beautifully adapted for swimming. Many fishes, moreover, have a bladder filled with air, situated immediately above the spine, by the dilatation or compression of which their specific gravity is said to be varied. The thoracic part of the body is thrown forwards towards the head, so that fishes may be said to have no neck, and thus the hinder part of the body is more free and fitted for motion. The limbs are formed into fins: the fore legs constituting what are termed the *pectoral* fins, and the posterior extremities the *ventral*. Besides these fins, ordinary fishes are furnished with one or two *dorsal* fins, one *anal* fin, and a *caudal* fin, or tail.

The fins consist of a thin, elastic membrane, supported by rays. The rays are of two kinds: those which consist of a single bony piece, usually hard and pointed, are called spinous rays; and when the rays are formed of numerous portions of bone, united by articulations, and frequently divided longitudinally into several filaments, they are called flexible rays. The principal organ of motion is the tail; the dorsal and ventral fins apparently serve to balance the fish, and the pectorals to arrest its progress when required.

The scales are composed of two substances, one resembling horn in its texture, and the other of a harder and bone-like nature; they are generally attached to the skin by their anterior edge, and consist of numerous concentric laminæ, secreted by the skin, the smallest of which is first formed. Certain scales, forming a continuous series, in a slightly waved line from the head to the tail of a fish, are pierced in or near the centre, and furnished with a tube, through which a slimy matter is poured, which serves to lubricate the body of the animal. This series of tubes forms a line visible on the sides of the body, and which is termed the *lateral line.* These scales are pierced through near the centre by a little tube, that allows the exudation of the glutinous or mucous secretion, produced by glands beneath, and which thence spreads over the surface of the fish, defending it from the action of the water.



FINS OF A FISH.

A Anal Fin. C Caudal Fin. D Dorsal Fin. P Pectoral Fin. V Ventral Fin. L Lateral Line.

The gills of fishes are, in general, fringes on gill arches, as may be seen in the herring or salmon, protected by gill-covers. Each gill-cover, or *operculum*, is divided into five parts—the *pre-operculum*, the *operculum*, the *sub-operculum*, the *inter-operculum*, and the *branchiostegous*, or gill-covering rays. In some fishes, as the eel, the branchial aperture is very small, and placed far behind the cavity containing the gills themselves. In the shark tribe the gills are fixed, there are no true gill-covers, the water escaping through fine branchial apertures on each side. In the flat skates, the mouth, nostrils, and branchial orifices are on the under surface, and the eyes on the upper surface, near which are two temporal orifices, which, while the fish reposes supine on the mud, admit the entrance of the water into the respiratory or branchial cavity, and also its exit. In the lamprey, seven orifices on each side of the neck lead to so many cells, performing the office of gills, and through these orifices the water is received and expelled. The teeth in fishes vary exceedingly; in some species they are disposed upon the jaws, the palate, the tongue, and the throat; in others, the mouth is destitute of teeth, while the throat or pharynx is provided with them. They differ also very greatly in form; in some fishes they are constructed for crushing; in others, for cutting; in others, for prehension; but in every instance their character accords with that of the food upon which the species habitually subsist.

The growth of fishes, more or less indefinite, is determined by food and temperature, and consequently does not stop at a given point, and at a given date. And, as another peculiarity, they reproduce their species long before attaining even their average size. Salmon, for example, hatched in the spring, return to the rivers for the purpose of breeding in the winter, or early in the next spring though only of the size to which the term "*grilse*" is applied. Trout, of the same age, in different rivers, vary from half a pound to six, seven, or eight pounds in weight, and, like the salmon, breed before they are half grown. The same remarks apply to other fish.

THE MUD-FISH.*

A very remarkable creature was to be seen at the Crystal Palace, Sydenham, a short time ago, which might be pronounced half fish and half reptile, and bore the name of the Lepidosiren, or Mud-fish. In 1837, several specimens of this animal were brought to this country from the river Gambia, in Western Africa, by T. C. B. Weir, Esq., one of which was presented to the Royal College of Surgeons in London; and an elaborate account of it, by Professor Owen, was published in the 18th volume of the "Linnæan Transactions."

The body of this creature is fish-like and elongated, the skin is covered with scales, a fin runs down the back and along the surface of the posterior part of the body. There are true gills and gill-covers; but the nostrils, unlike those of fishes, have an internal opening on each side of the mouth, between the lips and the outer edge of the large series of teeth; while their outer orifices are close together, on the under side of the inner lip.

Provided with true gills, the lepidosiren possesses also true air-breathing lungs, into which, as in the case of the frog or newt, the atmospheric air is forced by the action of the mouth, so that the animal respires both air and water. It has two anterior and two posterior elongated, awl-shaped appendages or limbs, which serve as supports to the body when resting at the bottom of the water, or when crawling on the mud; above the rest of the anterior limbs there are on each side two smaller appendages, which seem to aid in directing the movements of the creature in the water, through which it propels itself by the paddle-like action of the tail. Both the anterior and posterior limbs are fringed with a delicate membrane or web, and are exceedingly mobile and flexible, being used, as Dr. Gray observes, more like feet than fins, especially when they are within reach of some fixed body which the animal can use as a fulcrum. The sides of the head are furnished with lines of mucous pores, and there is a line of similar pores running down each side of the body, for about three parts of its length, becoming indistinct as they approach the tail. These pores plentifully exude a lubricating fluid, or mucous, with which the general surface of the animal is smeared. The specific title, *annectans*, given to it by Professor Owen, indicates its position in the scale of organic beings, forming, as it does, a link between reptiles and fishes, its structure exhibiting several of the leading characters of each of these classes.

In its native region, where it abounds, this creature dwells, during the hot and dry months, in the mud of the swamps along the Gambia, making for itself a convenient cavity, in which it remains, coiled up and dormant, till the return of the rainy season. Sometimes the case is almost or entirely composed of dry leaves, agglutinated together by the mucous secretion of the body. Mr. Daniel, who lived during several years on the Gambia and on Macarthy's Island, informed Dr. Gray that the lepidosiren is found only in the rice-fields, which are for more than half the year under water, and that they are procured by the natives towards the end of the dry season, when they are dug out of the nearly dried mud.

Miss Weir thus confirms this testimony in a note given in the paper already alluded to as found in the "Linnæan Transactions:"—"Fish taken in the summer of 1835, on the shores of Macarthy's Island, about three hundred and fifty miles up the river Gambia. They were found about eighteen inches below the surface of the ground, which, during nine months of the year, is perfectly dry and hard; the remaining three months it is under water. When dug out of the ground, and placed in water, the fish immediately unfold themselves, and commence swimming about. They are dug up with sharp stakes, and used as food." Another account states that they are eaten fried, and, like eels, have a rich, oily flavour.

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* Lepidosiren annectans.

In June, 1856, Mr. Bartlett, the superintendent of the Natural History Department of the Crystal Palace, received from Western Africa four blocks of hard, dry, muddy clay, each one about the size of a quartern loaf, and sewn up carefully in a canvas wrapper. Captain Chamberlayne, who had sent them, directed that they should be placed in a tank of fresh water, at the temperature of eighty-three degrees. This was done, and in a short time the clay became softened, and crumbled away, and the inner case or cocoon, in which a lepidosiren was inclosed, floated motionless to the surface. This case, or cocoon, is probably nothing more than the layer of mud mixed with the mucous exuding from the body of the creature, so that it may have a proper degree of tenacity. The cavity is moulded by the coiled-up body, and often, perhaps usually, bears the impression of the scales.

It was not long before this cocoon became agitated: it was evident that the lepidosiren was endeavouring to extricate itself; a few struggles, and it had burst away; immediately it began to swim about, and then diving into the mud at the bottom of the tank, sheltered itself from further observation. The next morning two more lepidosirens emerged from their cocoons, and in the course of the following day the fourth of the party floated to the surface, but it was dead and putrescent.

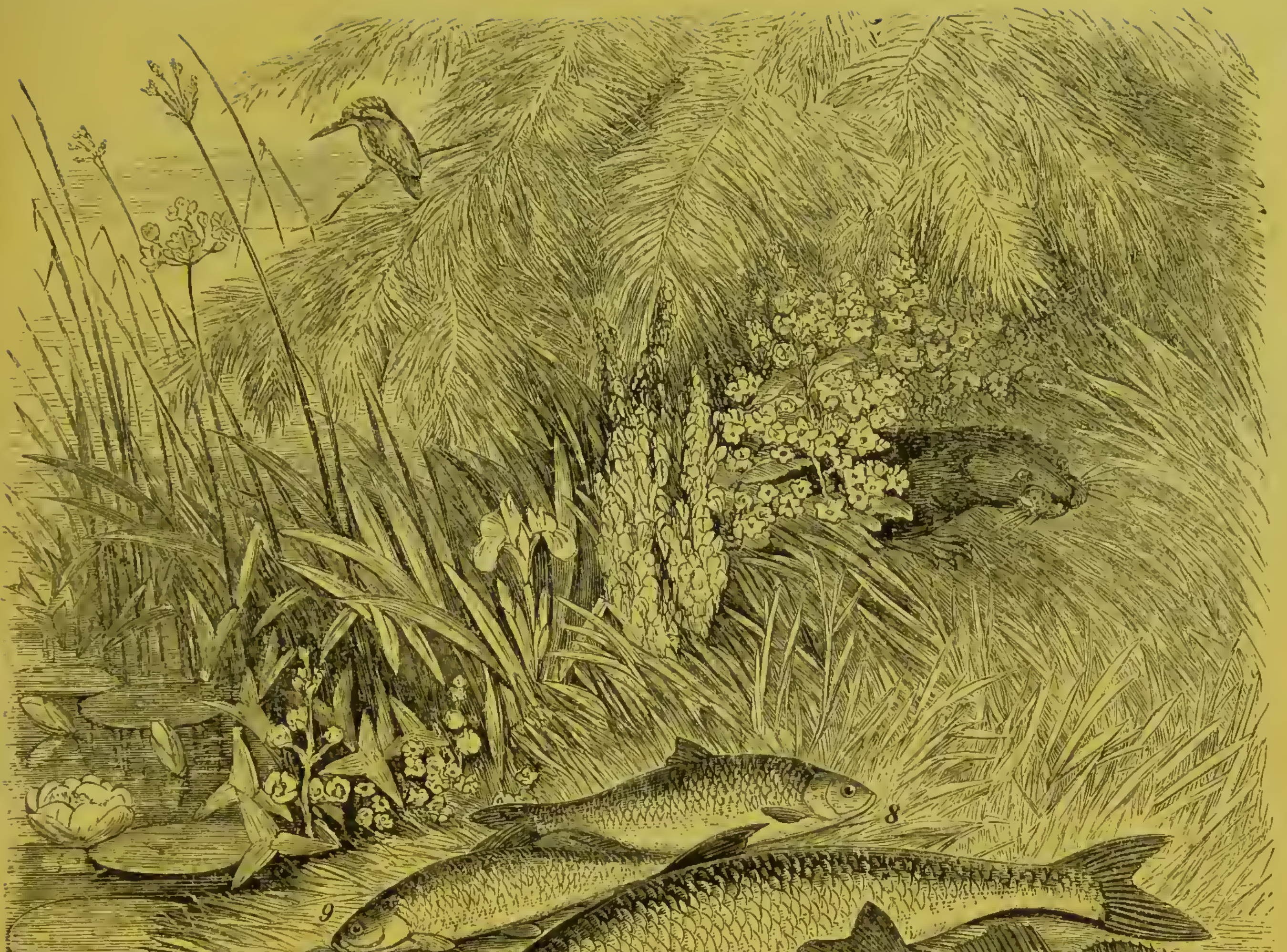
The three living ones were meagre, and about nine inches long. Supplied with earthworms, small frogs, fish, and occasionally with raw flesh, they began very eagerly to feed. They did not, however, live together in peace, for they were seen at times assaulting each other. One of them, probably in an effort to escape from its antagonist, leaped out of the tank, and got into the large fountain-basin, where it remained among the gold-fish and the water-lilies. The two others lived on for some time, apparently agreed, when it was suddenly discovered that only one survived, having actually killed its companion, and, with the voracity of a cannibal, had left only the head and some part of the body, probably that which it liked least, undevoured. In three months it grew rapidly, actually doubling its length.

It was now transferred to the basin from which the other—the companion of the lilies and gold-fish—was withdrawn, and placed again in the tank, but where it suddenly died; and thus the destroyer of his fellow alone survived. Here it continued to thrive at liberty, but was rarely seen, and when observed near the surface, it was apparently sick, and finally was taken out dead. The writer saw it repeatedly before this, and afterwards heard that it had now attained to twenty-eight and a-half inches in length, was no less than ten inches and a-half in circumference, and weighed four pounds and three quarters. A fine plaster cast was taken from this specimen by Mr. Bartlett, who also made a perforation of the skull, to show the remarkable structure of the teeth and jaws; while the skull, the viscera, and the muscular structure were preserved in spirits for after examination. The exterior of the animal has been carefully preserved, and may be seen by any visitor to the Reptile Department of the British Museum.

Mr. Bartlett remarked, in a note to Dr. Gray:—"This creature masticates the food much, frequently putting it forward, almost quite out of its mouth, and then gradually chewing it back again. * * * It rises frequently to the surface of the water to breathe, and at other times supports itself on its fin-like appendages, and, with the aid of its tail, raises its body from the ground, the fins being bent or curved backwards.

"The movement of this animal is generally very slow, and would give one an idea that it was very sluggish: this, however, I have good reason to know is not the case, as, in attempting to capture the one at liberty in the large basin, it darted away with the rapidity of an arrow. I have reason also to believe that the animal finds its food as much by scent as sight. With reference to the cocoon, the end covering the nose of the animal is rather pointed, and has an aperture about the size of a pin's head, which I have no doubt enables it to breathe during its state of torpor. The animal, when in its case, is coiled nearly twice round; and I observed in each of the blocks of clay a small hole, about the size of a mouse-hole, which was quite smooth in the inside, as though the fish had crept through it."

An acquaintance with fishes—to which we now proceed—occupying the waters as thickly as animated beings do the land, and extending over three times their space, cannot but be desired by every lover of knowledge. But there are circumstances which render it of peculiar value to the people of our country; Great Britain possessing a coast-line of above 3,000 miles in extent, with a population more or less engaged in fisheries. Our shores are indented with bays and harbours, which protect the fisherman,



RIVER FISHES.

1. Barbel.
2. Perch.
3. Trout.
4. Grayling.
5. Tench.
6. Chub.
7. Bream.
8. Roach.
9. Dace.
10. Craw-fish, or Cray-fish (Crustacea).
11. Gudgeon.
12. Bull Trout, *young*.
13. Loach.
14. Miller's Thumb.
15. Ruffe, or Pope.
16. Bleak.
17. Minnow.

facilitate his employment, and render it a branch of national industry; while they abound with those species of fish which exist in the largest numbers, and yield a supply of acceptable food.

The example set by Yarrell, in his admirable work on "British Fishes," has been followed by eminent men in other countries. Nilson and Eckstran have illustrated the fishes of Northern Europe, and Kroyer those of Denmark. Longchamp's "Faune Belge" exhibits fifty-three fresh-water and forty-one species of sea-fish. The fresh-water fishes of Central Europe have engaged the talents and attainments of Agassiz. To Prince C. L. Bonaparte we owe a valuable work on Italian ichthyology. Eichwald has described the fishes of the Caspian. In Siebold's "Fauna Japonica" there are accounts and figures of Japanese fishes. Sir John Richardson has produced many valuable memoirs on the ichthyology of China and Australia. And, without enumerating many other writers to whom our obligations are still increasing, it will thus be apparent that invaluable additions have been made, and still are making, to our knowledge of fishes, distributed in the waters of the earth. Climate, composition of the element in which they live, whether salt, brackish, or fresh, and the conformation of the river or sea-bed, on which the depth of water depends, appear to be the great regulating influences of their distribution. One order of fishes,* having their name taken from a thorn and a wing, includes those which have bony skeletons, with prickly spinous processes in the dorsal fins.

Of the first family † to be noticed, the Common Perch may be regarded as a type. Their flesh is generally well-flavoured and wholesome. They inhabit both salt and fresh water.

THE PERCH. ‡

One of the angler poets old Izaak Walton loved to quote, says:—

"I care not, I, to fish in seas;
Fresh waters best my mind do please,
Whose sweet calm course I contemplate,
And seek in life to imitate."

The Lady Julia Berners, in the "Book of Sports," published in 1496, says of the angler:—"He at the least hath his wholesome walk and merry at his ease, a sweet air of the sweet savour of the mead flowers: that maketh him hungry. He heareth the melodious harmony of fowls. He seeth the young swans, herons, ducks, coots, and many other fowl with their broods; which me seemeth better than all the noise of hounds, the blasts of horns, and the cry of fowls; than hunters, falconers, and fowlers can make. And if the angler take fish, surely then there is no man merrier than he in his spirit. Also, whoso will use the game of angling, he must rise early, which thing is profitable to man in this wise, that is to wit, most to the heal of his soul. For it shall cause him to be holy; and to the heal of his body, for it shall cause him to be whole. Also to the increase of his goods, for it shall make him rich. As the old English proverb says in this wise, 'Whoso will rise early shall be holy, wealthy, and zealous.'"

"The bright-eyed perch, with fins of Tyrian dye," is one of the most beautiful of our fresh-water fishes. The upper part of the body is of a rich greenish brown, passing below into hues of a golden yellowish white. The common perch is the type of a family consisting of numerous species, some inhabiting the sea, but all more or less resembling the one found in England.

It is probable that many species remain to be discovered, as their geographical distribution is so extensive as to comprise the most opposite parts of the globe; as, for example, North America, Java, and New Zealand. There are few rivers, streams, lakes, canals, or ponds in England in which perch may not be found; though, like the trout, it probably prefers clear and rapid streams, and haunts the moderately deep waters and hollows under the banks. It is a sociable fish, and swims in shoals.

In a piscatorium formed by Mr. Jesse, at Bushey Park, he says "the perch were the boldest and most familiar of any of the fish, as I found no difficulty in soon getting them with eagerness to take a worm out of my hand." Mr. Yarrell states that perch have been known to breed in a small vase.

Like the carp, it possesses great tenacity of life when out of its natural element, and bears easily a journey of forty or fifty miles, if refreshed occasionally with water, and placed in wet moss. In some parts of the Continent the fish is taken from the ponds in the morning, carried to market, and if not sold, is restored to its proper element and home at night.

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* Acanthopterygii.

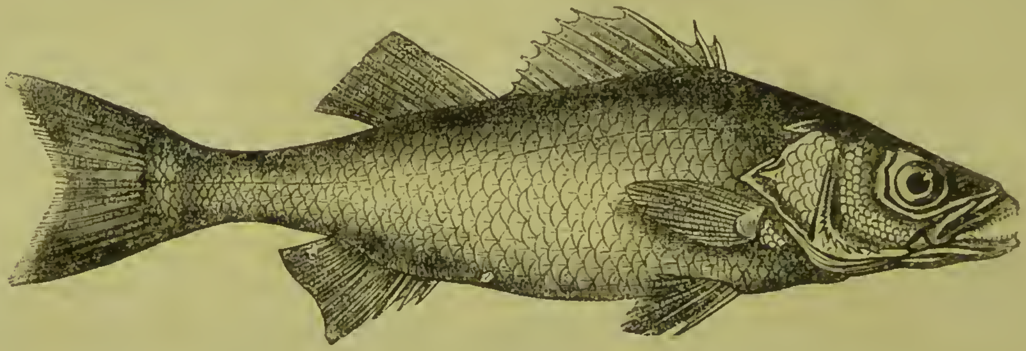
† Percidæ. Percoïdes: Cuvier.

‡ Perca fluviatilis.

A perch of three pounds is considered a large size; but instances are mentioned of individuals having been taken weighing five, six, eight, and nine pounds. The average weight is generally inconsiderable. Mr. Turton, of Sheffield, an experienced angler, mentions a case in which sixty perch were taken by the red worm during a few hours, one evening, out of a reservoir at Chapel-en-le-Frith, in Derbyshire, and their aggregate weight was sixteen pounds.

Mr. Jesse said some years ago: "Great numbers of perch are bred in the Hampton Court and Bushey Park ponds, all of which are well supplied with running water and plenty of food; yet they seldom arrive at a large size. In a neighbouring pond, which is only fed with drainage water, I have caught very large perch. The perch in the Regent's Park are very numerous. Those I have taken, however, are almost invariably of one size, from half to three quarters of a pound. Why they should have arrived at this size and not go on increasing in size, is a circumstance it is not very easy to account for. I have, however, remarked it to be the case in other ponds. Perch spawn at the end of April, or the beginning of May. A perch of half a pound weight has been found to contain 280,000 ova."

Walton's time to begin fishing for perch was "when the mulberry had commenced to put forth its buds." It is very pleasing to have natural guides of this sort; our ancestors had many such, and anglers still retain some of them. Walton describes the perch as "a very bold biting fish," and he relates that some one remarked they were "like the wicked of this world," not afraid, though their companions perish in their sight. Their social habits, voracity, and boldness prove their destruction. These qualities render the perch an easy prey to the young angler, and it is generally his first object of pursuit, until he becomes emulous of the higher skill of the fly-fisher. The flesh of the perch is firm, white, and of good flavour.



THE BASSE.

THE BASSE, OR SEA-DACE.*

This fish is very common around the more southern shores of our island. It was known to the Greeks and Romans, who applied to it names indicating its voracity. This fish wanders in shoals, and often ascends rivers, even beyond the tide-way; it will, indeed, live altogether in fresh water. The Basse usually measures from twelve to twenty inches in length, but is sometimes caught weighing from ten to fifteen pounds. The general colour of the back is a dusky blue, passing into silvery beneath; there are two dorsal fins, which are pale brown; and, as in the perch, there are two external openings to each nostril. This species is mostly taken by nets, but often by hooks attached to deep sea-lines; they may be caught also during the flood-tide, with a long rod and strong line, from a pier-head or other projecting situation. These fish bite freely, and feed on the fry of fishes, on crab-like creatures, and marine insects.

It will not do, however, for the fresh-water angler to try his hand at catching salt-water fish by means of a London-made fishing-rod, a silk trolling line, and hooks of the best manufacture invented, upon gut. Priding himself as he may on the neatness and efficiency of his tackle, the red-capped and big-trousered men, who are moving about their boats, will smile at his preparations, and predict to one another the failure of his hopes. To succeed, he must wend his way to some country "warehouse," where he can buy, at a small cost, a deep sea or "gipping" line, some six fathoms long, of great strength; some "pouter hooks," which, though silvered over, are eight a penny; a sinker, or heavy lead; a pair of "chop-sticks," which consist of two bits of thick iron wire, and a bunch of "snoods," which are thin but strong lines about two feet long.

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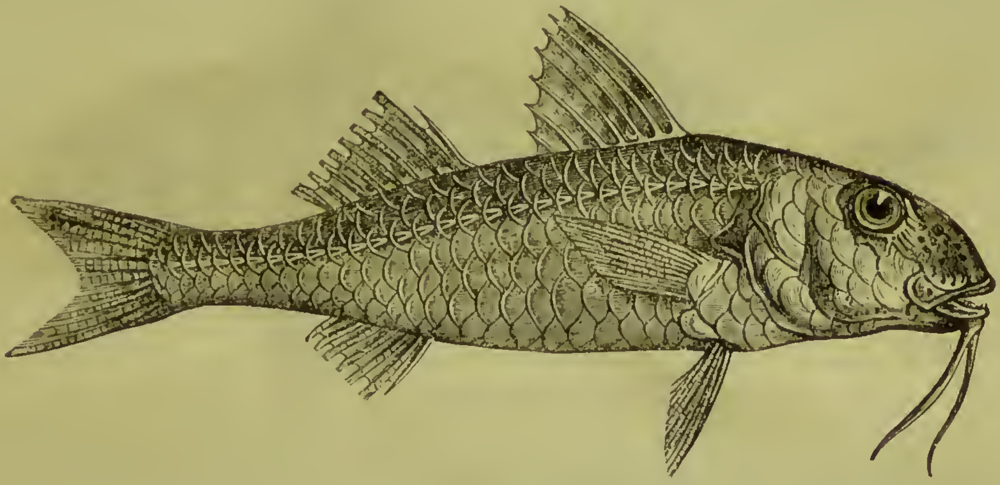
* Labrax lupus.

Thus provided with articles for his sport, they have now to be arranged as follow: the line has to be fastened on to the sinker; just above, the chop-sticks are to be attached, so that an angle may be formed, like the legs of a pair of compasses; then, on their ends, the snoods are to be fastened; and to the end of the snoods the hooks are to be tied. This is, however, sooner said than done; it even requires no little skill to tie knots wanted in fresh-water angling, but even this often fails in marine experiences; and the best course to be taken is that of consulting one of the fishermen just by, who, for a trifling "consideration," will show the way to put the required implements in order, and also to make "knots" that will hold, which, like many an apparently difficult thing, are matters easy enough, when, as old Roger Bacon says, "you only know how." The amateur has now to engage a boat, to be pulled to what the fisherman calls "hungry ground," because the fish there are hungry; and having baited his hooks, according to the kinds likely to be taken—and for this also he must obtain information—he has to throw his tackle into the sea, and await his luck.

Another family* of this order consists of the Mullet tribe. The mullet was held in greater esteem in ancient than it is in modern times; for it was a common proverb, that he who took one never ate it; the high price which it bore being an inducement to hurry with it to the best market, where it fetched, it is said, as much as its weight in silver; and there even arose contentions among epicures, as to who should become the purchaser. It is stated by Martial, that the cost of a mullet of about four pounds and a half was still higher, and the price rose at each successive increase of weight. A sum equivalent to £240 was once given for three of more than ordinary size, which happened to be in the market just before a banquet of unusual magnificence.


THE RED MULLET.

Mullets were often brought alive in glass vases to table, and a barbarous pleasure was derived from witnessing the changes of colour they underwent in expiring. Apicius invented a mode of suffocating the mullet in a kind of pickle; and Seneca endeavoured to put an end to these practices, disgraceful to a people who stood the foremost in ancient civilisation. The roe of the mullet is used in Italy for the purpose of making a preparation which acts as a stimulus to the appetite. The part is taken out whole, and covered with salt for about five hours, and is then pressed, but not strongly, between two boards. It is subsequently washed, and afterwards exposed to the sun, when it soon becomes fit for use. The red mullet is the most familiar example of the tribe.

THE GRAY MULLET.†

The Gray Mullet is found generally on the western shores of Europe. This fish, of which there are several varieties, does not proceed far from land; it is fond of shallow water, and also the mouths of rivers, which it frequently enters. This is a striking peculiarity in its habits. In France the mullet is taken in the Garonne, the Seine, and the Loire; and it has been found in the latter river at the distance of forty leagues from the sea. It is stated in the French "Encyclopédie" that the mullet spawns in the Loire like the salmon.

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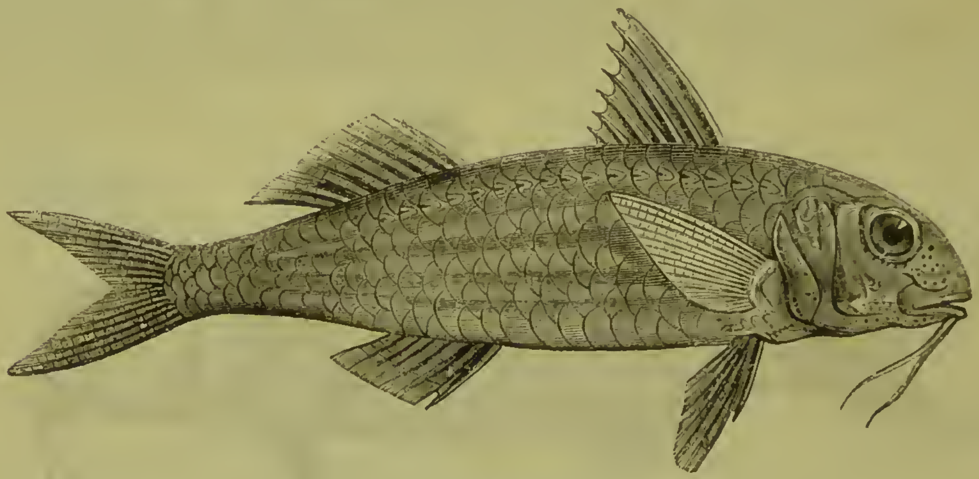
* Mugilidæ.

† Mugil capito.

Fuller, in his account of Sussex worthies, mentions, among other things for which that county is celebrated, the six following: a Chichester lobster, a Selsey cockle, a Pulborough eel, an Amberley trout, a Rye herring, and an Arundel mullet. This fish is well known in the river Arun, in that county, and was found twenty miles from the sea in 1834, which Mr. Yarrell states was higher than it usually ascended—a circumstance attributed to the heat of the summer.

The gray mullet only ascends and descends rivers with the flow and ebb of the sea. It haunts the shallow waters on the coast, never going far from land; and though it ventures up rivers, it invariably returns with the tide. Walton does not once mention having angled for the gray mullet, but, had he done so, the sport would have called into exercise all his skill and all his patience, for so careful is it not to swallow any large or hard substance, that it has a trick of getting the bait into its mouth, and of rejecting it if suspicion be at all excited. Even if hooked, it is often only in the lips, and it then plunges with much violence, and often effects its escape.



THE STRIPED RED MULLET.

The gray mullet spawns about Midsummer. The general colour of the adult is a darkish gray, with a tinge of blue, and the sides and belly, which are white, are marked by dark, longitudinal lines. The form of the mouth is very peculiar. The lower jaw is divided in the middle by an ascending angular point, which, when the mouth is closed, passes within the upper jaw; the upper jaw also, if viewed from below, is likewise angular.

THE STRIPED RED MULLET.*

This fish is taken along the whole length of our southern shores. On other parts of the coast it is comparatively rare. It seldom exceeds fourteen inches in length. A specimen is mentioned which weighed 3 lbs. 6 ozs., and was in high perfection. When the colours are finest the fish is in the best condition; and they are also most abundant at that time, usually the months of May and June. The brilliancy of their appearance is owing to extravasated blood under the cuticle, which is transparent. In places where the scales have not been forcibly removed, the colour is a pale pink, which may be regarded as the natural colour of the fish. Spring is the season for spawning, and towards October the young are above the length of a man's finger.

Mullets are caught by the mackerel nets, and in larger quantities by the trawl nets. They feed near the bottom, and are provided, as in the case of many other fish of similar habits, with an appendage articulated to the mouth, and which Mr. Yarrell found on examination to consist of numerous longitudinal muscular and nervous fibres. He says: "These appendages are to them, I have no doubt, delicate organs of touch, by which all the species provided with them are enabled to ascertain, to a certain extent, the qualities of the various substances with which they are brought in contact, and are analogous in function to the beak, with its distribution of nerves, among certain wading and swimming birds, which probe for food beyond their sight; and may be considered another instance, among the many beautiful provisions of Nature, by which, in the case of fishes feeding at great depths, where light is deficient, compensation is made for consequent imperfect vision."

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* Mullus surmuletus.

When in fresh water, the mullet is sometimes taken by anglers, just before it returns to the salt water with the ebb tide. It is, however, extremely cautious in taking a bait, and is described as having more intelligence than fish generally. Not only is it difficult to take them with a line, but they even make their escape when inclosed in a net, by throwing themselves over its outer circle. If one succeed, all the rest follow, like a flock of sheep, and the fishermen lose the reward of their labour.

Mr. Crouch, who contributed some valuable remarks to Mr. Yarrell's work, describes the susceptibility of constraint and danger in the mullet, from observations made at a salt-water mill-pool, of about twenty acres in extent, into which the mullet entered by the flood-gate. On the gates being closed, owing to the turn of the tide, the wall is examined in every part; and, when the water is near the summit, efforts are made to throw themselves over, by which they are not uncommonly left on the bank, to their own destruction.

Oppian, who lived in the beginning of the third century, described the habits of the mullet in the following terms:—

> "The mullet, when encircling seines inclose,
> The fatal threads and treacherous bosoms knows.
> Instant he rallies all his vigorous powers,
> And faithful aid of every nerve implores;
> O'er battlements of cork up-darting flies,
> And finds from air the escape that sea denies.
> But should the first attempt his hope deceive,
> And fatal space the imprison'd fall receive,
> Exhausted strength no second leap supplies
> Self-doomed to death, the prostrate victim lies;
> Resigned, with painful expectation waits,
> Till thinner elements complete his fates."

The habit alluded to in the last lines was doubted by Mr. Pennant; but the accuracy of Oppian is confirmed by Mr. Crouch, who says: "When, after being surrounded by a net, two or three have made their escape, and the margin of the net has been secured, and elevated above the surface, to render certain the capture of the only remaining one, I have seen the anxious prisoner pass from end to end, examine every mesh, and all the folds that lay on the ground; and at last, concluding that to pass through a mesh or round it afforded the only, though desperate, chance of escape, it has retired to the greatest possible distance, which has not been done before, and rushed to that part which was most tightly stretched. It was held, however, by the middle; and, conscious that all further effort must be unavailing, it yielded, without a further struggle, to its fate." A young mullet, of less than an inch in length, will throw itself over the edge of a cup, in which the water is an inch below the brim.

We now pass to another family,* termed "the hard-cheeked," from the singular characters presented by the head. Thus, the Gurnards are fishes always remarkable for singularity of form. The head is mailed, and angular. There are two distinct dorsal fins, and beneath the pectorals there are detached rays. The brilliancy of their colouring is often very observable. They derive their popular name from a grunting noise, which they make when taken out of the water.

THE RED GURNARD.†

This fish, often called the Cuckoo Gurnard, from the similarity of the sound it makes to that of the cuckoo, is very common on the British coasts. Like the rest of the species, it swims near the bottom and feeds on crustacea, and, when captured, is very tenacious of life.

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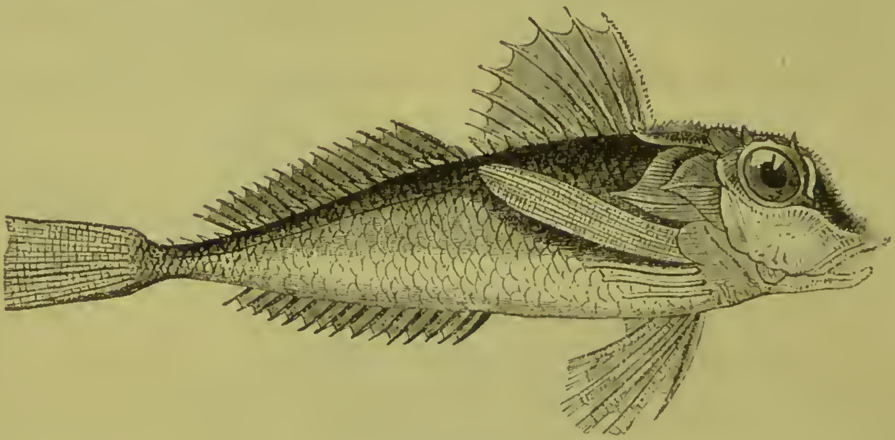
* Loricati.

† Trigla cuculus.

The Red Gurnard is excellent for the table; it is in the greatest perfection during the winter months, and seldom exceeds twelve or fourteen inches in length. This fish is mostly taken in trawl nets, as it swims low; it will, however, bite freely, and may be caught by means of hand-lines, the hooks being baited with any silvery shining fish, as a piece of the sand-lançe.

THE SAPPHIRINE GURNARD.*

THIS fish is as common as the former, and exceeds it in size, often measuring from eighteen inches to two feet in length. Its general colour is a brownish red; the inner surface of the pectoral fins is of a fine blue; the head is large and flat. Its flesh is excellent, when properly cooked; that is, stuffed, roasted, and served up with rich sauce, or drawn gravy. On the boards of the fishmongers' shops this fish may be commonly seen, with its large pectoral fins spread out or tied together over its head, giving it a curious appearance.



THE RED GURNARD.

This fish is taken by means of the trawl net, in deep water. This net is long and conical, being from sixty to seventy feet in extent, with a square mouth of eighteen feet in breadth; it is dragged along by means of a rope, from a sailing boat of ten or twelve tons burden. In some parts, however, the trawling nets used are far larger, and the vessels are of seventy or eighty tons burden, and cutter-rigged.

THE FLYING GURNARD.†

THE Flying Gurnard inhabits the Mediterranean. It varies from one foot to fifteen inches in length, and is of a brown colour above, with spots of a deeper tint; the sides of the body are red, and the under parts are of a pale rose colour. The large pectoral fins are of a blackish tint, mottled and spotted with blue; the ventral and anal fins are of a rose colour; the anterior dorsal is gray, with clouded markings of a deeper hue; the posterior dorsal is transparent, and its rays are of a pale colour, spotted with brown. Another species inhabits the Indian seas.‡

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* Trigla hirundo.

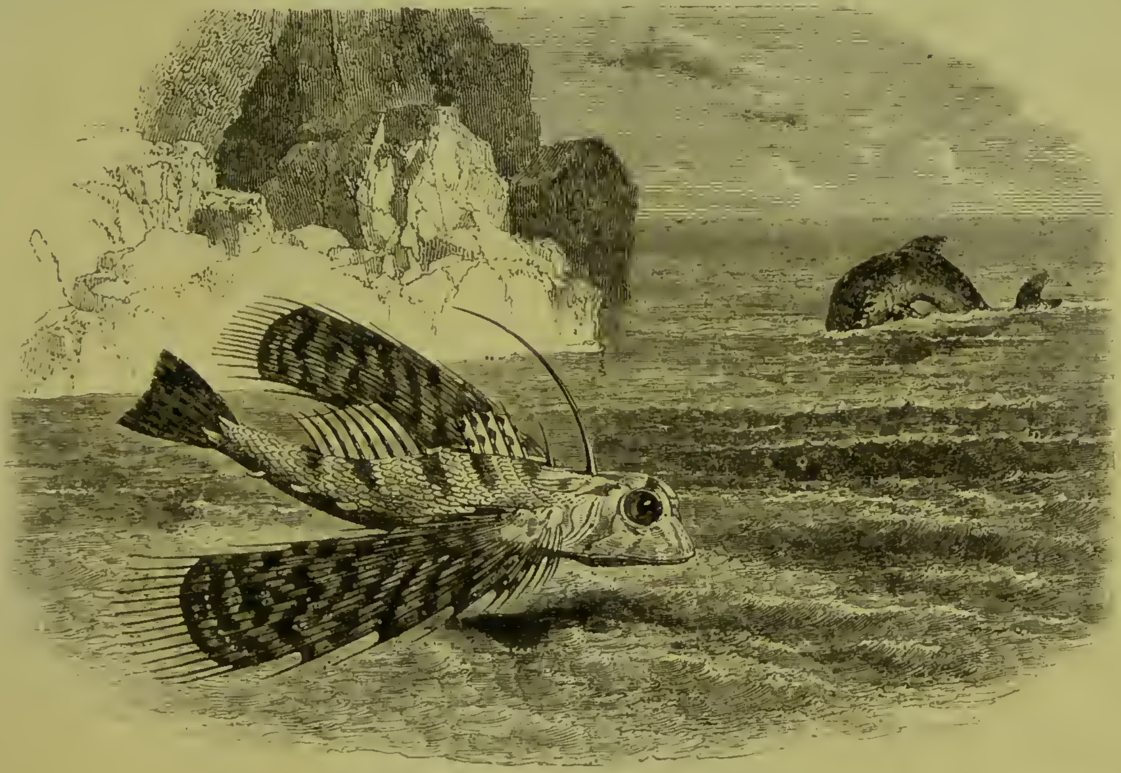
† Dactylopterus volitans.

‡ D. orientalis: Cuvier.

The ancients were well acquainted with the flying gurnard, and some other aeronautic species. Oppian, mentioning no less than three, says:—"The swallow's flight is low and short; the irexes scarcely rise above the water, but advance, alternately beating and skimming the surface of the waves; the theutis alone takes a long flight." "Authors differ considerably," says the Rev. C. D. Badham, M.D., "as to the maximum height attained by these volatile fish." In many instances, as intimated by the Greek poet above cited,

> "'Tis only a bounce, as though they were trying,
> By bounding and skipping, to teach themselves flying."

Others of them take long, flying leaps, and then subside slowly on the parachute of their pectoral fins. The *dactylopterus volitans* (and not *volans*, for even his progress is but a series of short, fitful flights, not one sustained effort) can, however, Sir F. Herbert says, fly forty feet. This is probably above the mark. Gillius says from six to eight feet, which is certainly below it; and various other writers assign intermediate altitudes; but all are agreed that these creatures, to whatever height their powers of propulsion may succeed in first carrying them, can remain on the wing but for a very brief period.



THE FLYING GURNARD OF THE INDIAN SEAS.

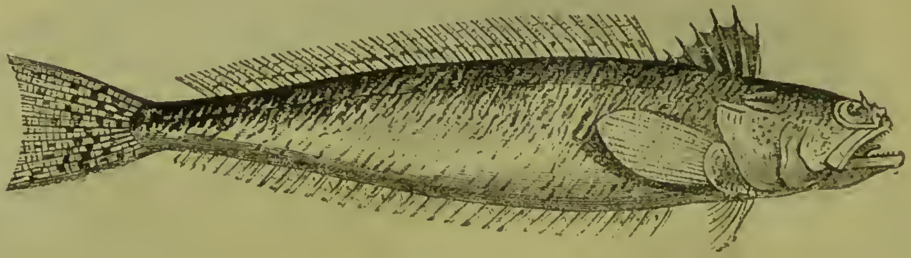
During this short exodus from the deep, whilst the membrane of their fins remains moist and supple, few spectacles in natural history are more interesting for the eye to follow than the evolutions of a scared flight of these dactylopteri, rising, as by magic, out of the waves, and winging its wide-spread way, like an immense flock of birds, over the deep. So fearful are they of surprise, that a shoal has been known to emerge suddenly on the mere splash of a pebble thrown into the water; generally, however, it is the pursuit of some hungry bonetus through the liquid plain that causes their most strenuous efforts; and as there is no corner to hide in, the sole chance of escape depends on the speed they may employ, and on the impossibility of the blood-thirsty polyphemus, however hungry he may be, gorging their whole phalanx. We attempt their flight in verse:—

> "When keen-eyed triglas see the darkening foe,
> They shoot like meteors from the depths below;
> Troop to the top, uncurl their stiffened tails,
> And lash the refluent surge with foaming flails.
> Upborne awhile, on vigorous pinions fly,
> And the grim pursuivant, elate, defy;

> Till, warned by flagging powers and aching breast,
> The panting quarry dips, in hope to rest.
> Delusive hope! scared as they touch the main,
> The rushing monster scatters them again!
> And now succeeds a fluttering, broken flight;
> They rise to droop, ascend to re-alight;
> Hard press'd, now skim along the watery waste,
> O'er many a liquid rood in rueful haste,
> Beat with long fins the agitated spray,
> Too weak for flight, and flap their noisy way;
> Till gasping, faint, and litter'd o'er the brine,
> They drop into their tomb, and make no sign."

THE GREAT WEEVER, STING BULL.*

According to Merrett, the English name of Weever, or Wiver, is derived from the French term for this fish, *La Vive;* a name given it from its living a long time out of the water. It is called in Sussex the "Sea Cat."



THE GREAT WEEVER.

Drayton says:

> "The Weever, which although his prickles venom be,
> By fishers cut away, which buyers seldom see;
> Yet for the fish he bears is not accounted bad."

The author of this song in the "Poly-Olbion" is right in both instances. The flesh of this creature is generally regarded as excellent; while its prickles render it formidable. "I have known," says Mr. Couch, "three men wounded successively in the hand by the same fish, and the consequences have been in a few minutes felt as high as the shoulder." Its dorsal fin-rays are very numerous.

Two allied species are the Sea Scorpion and the Father Lasher.

THE SEA SCORPION.†

The Sea Scorpion, or Short-Spined Cottus, is very common on our coasts, and is found very frequently under stones or sea-weeds, in the little pools left by the retiring tide. The head is large and armed with numerous spines; the upper jaw rather the longer; the teeth small and sharp; the eyes large; the body tapers off rapidly, and is mottled over with dark purple brown, occasionally varied with a rich red-brown; and the belly is white. The length rarely exceeds eight or nine inches. It feeds on the fry of other fishes and on crab-like creatures.

THE FATHER LASHER.‡

The Father Lasher, or Long-Spined Cottus, is about the same size, and resembles the last both in appearance and habits; but the two species are seldom found in the same immediate neighbourhood. The Father Lasher is abundant on all our rocky shores, and is easily known by the long spines on the top of its head, and the large pectoral fins which are usually spread out on each side its body like enormous hands. It is a very hardy fish, and will eat in an aquarium all kinds of animal food.

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* Trachinus draco. † Cottus scorpius. ‡ Cottus bubalis.

The common name of a species well known in this country is Stickleback.* The genus has the following characters:—Anterior dorsal represented only by free spines; body generally scaleless, but protected more or less at the sides by shield-like plates; the ventrals reduced to a single spine; and the head without spines or tubercles.

THE STICKLEBACKS.

SEVERAL species of Stickleback are found in the ponds and streams of this country, and one species exists in the salt water. They are very active and voracious, and live on aquatic insects and worms. They are included, under a great diversity of names, in the Natural History of every European country. They should even exist as far as Greenland, if it be true indeed that Fabricius saw there the same species, and not some one of those of America.

In Pennant's time these little fishes abounded in the fens of Lincolnshire; and at Spalding they appeared once in seven or eight years, in surprising quantities, and ascended, in thick columns, the river Welland, on which this town is situated.

THE FATHER LASHER.

Their extreme multiplication is surprising, for the eggs of the sticklebacks are large, and they cannot lay many of them. It is true, on the one hand, that they have but little to dread from other fishes, as they are defended against them by short and sharp spines; but they have internal and external enemies by which they are unceasingly tormented. Thus, one species attaches itself to the skin, and sucks their blood, while another sometimes almost fills the entire abdomen, compressing their intestines, and reducing them to a very small space.

Bloch assures us that these fishes live but three years. They are extremely agile, lively in their movements, and of an active disposition. Backer states that they leap vertically out of the water, to more than the height of a foot, and that in an oblique direction they can make springs still more considerable, when they are obliged to pass over stones or other obstacles. They can subsist a tolerably long time out of the water, especially when they fall into the humid grass. Their voracity is excessive. Backer has seen a stickleback devour, in the course of five hours, seventy-four new-born fish, of one species,† each of which was three lines in length.

THE THREE-SPINED STICKLEBACK.‡

THIS is the most common species, and is distinguished by the body being protected at the sides with shield-like plates, and the possession of three spines on the back. It is of an olive-colour above, and silvery white beneath, and varies from two to three inches in length. In the breeding season, the male assumes a pink hue on the under parts of the body, and the general colour of the upper parts is brighter, and often green. According to Bloch, this species spawns in April and June, and, according to Cuvier, in July and August.

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* Gasterosteus.

† Vandosia.

‡ G. aculeatus; Linnæus.

A naturalist thus describes the habits of these little fishes, during their confinement in a tub:—"When a few are first turned in, they swim about in a shoal, apparently exploring their new habitation. Suddenly one will take possession of a particular corner of the tub, or, as it will sometimes happen, of the bottom, and will instantly commence an attack on his companions; and if any one of them ventures to oppose his sway, a regular and most ferocious battle ensues; the two combatants swim round and round each other with the greatest rapidity, biting and endeavouring to pierce each other with their spines, which, on these occasions, are projected. I have witnessed a battle of this sort which lasted several minutes before either would give way; and when one does submit, imagination can hardly conceive the vindictive fury of the conqueror, who, in the most persevering and unrelenting way, chases his rival from one part of the tub to another, until fairly exhausted with fatigue. They also use their spines with such fatal effect, that, incredible as it may appear, I have seen one, during a battle, absolutely rip his opponent quite open, so that he sank to the bottom and died. I have occasionally known three or four parts of the tub taken possession of by as many other little tyrants, who guard their territories with the strictest vigilance; and the slightest invasion invariably brings on a battle. These are the habits of the male fish alone; the females are quite peaceful, appear fat, as if full of roe, and never assume the brilliant colours of the male, by whom, as far as I have observed, they are unmolested."

This species, and two others, have three sharp dorsal spines; but the present has the sides throughout their whole length defended by a series of vertical bony plates, forming a coat of mail; in the two others, the sides are only more or less partially defended.

THE FIFTEEN-SPINED STICKLEBACK.*

Of the habits of the Fifteen-spined Stickleback Mr. Couch thus speaks:—"It keeps near rocks and stones clothed with sea-weeds, among which it takes refuge upon any alarm. Though less active than its brethren of the fresh water, it is scarcely less rapacious. On one occasion, I noticed a specimen, six inches in length, engaged in taking its prey from a clump of sea-weed, in doing which it assumed every posture between the horizontal and perpendicular, with the head downward or upward, thrusting its projecting snout into the crevices of the stones, and seizing its prey with a spring.

"Having taken this fish with a net, and transferred it to a vessel of water, in company with an eel of three inches in length, it was not long before the latter was attacked and devoured head foremost,—not, indeed, altogether, for the eel was too large a morsel, so that the tail remained hanging out of the mouth; and it was obliged at last to disgorge the eel partly digested. It also seized from the surface a moth that fell on the water, but threw up the wings. The effect of the passions on the colour of the skin in the species of this genus is remarkable; and the specimen now spoken of, under the influence of terror, from a dark olive with golden sides, changed to pale for eighteen hours, when it as suddenly regained its former tints. It spawns in spring, and the young, not half an inch in length, are seen in considerable numbers at the margin of the sea, in summer."

Nearly thirty years ago, the following remarks were made by an intelligent observer, unacquainted with Natural History as a science, and who was not aware of what was then closely studied by others on a kindred species:—"In a large dock for shipping on the river Thames, thousands of pricklefish were bred some years ago, and I have often amused myself for hours by observing them. While multitudes have been enjoying themselves near the shore in the warm sunshine, others have been busily engaged in making their nests—if a nest it may be called. It consisted of the very minutest pieces of straw or sticks, the exact colour of the ground at the bottom of the water, on which it was laid, so that it was next to an impossibility for any one to discover the nest, unless they saw the fish at work, or observed the eggs.

"The nest is somewhat larger than a shilling, and has a top or cover, with a hole in the centre, about the size of a very small nut, in which are deposited the eggs or spawn. This opening is frequently concealed by drawing small fragments over it; but this is not always the case. Many times have I taken up the nest, and thrown the eggs to the multitude around, which they instantly devoured with the greatest voracity. These eggs were about the size of poppy-seeds, and of a bright yellow colour; but I have at times seen them almost black, which I suppose is an indication that they are approaching to life. In making the nest I observed that the fish used an unusual degree of force when conveying the material to its destination. When the fish was about an inch from the nest, it suddenly darted at the spot, and left the tiny fragment in its place, after which it would be engaged for half a minute in adjusting it. The nest, when taken up, did not separate, but hung together like a piece of wool."

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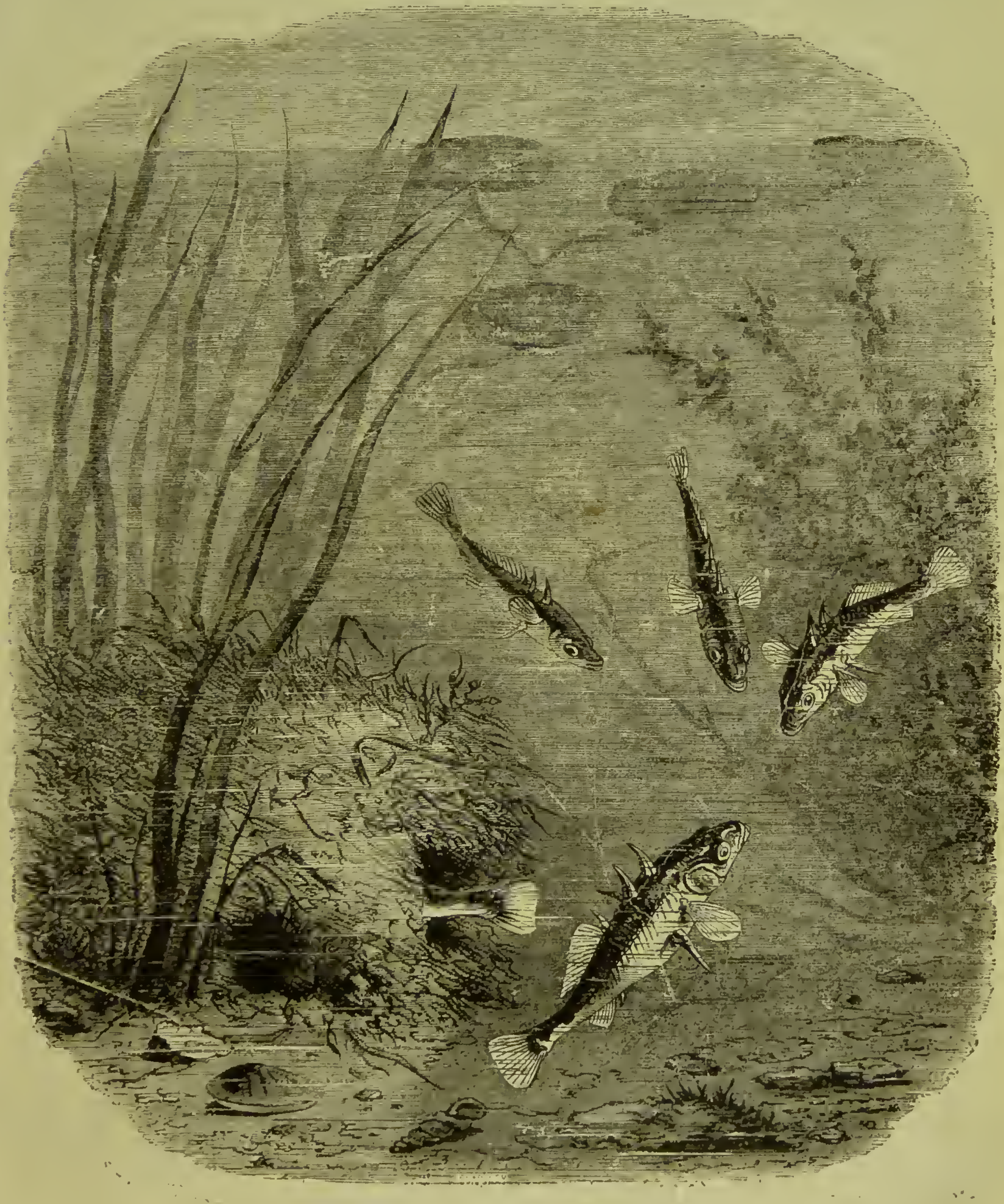
* Gasterosteus spinachia.



THE FOUR-SPINED STICKLEBACK AND NEST.

Many years after this statement was made, M. Costa gave great attention to the habits of the stickleback. He watched the whole process of the construction of the nest, the laying of the eggs by the female, and the care taken of them by the male. He says: "The stickleback has the foresight to cover the nest heavily with sand, to prevent its being swept away by the waters; and they glue together the materials of which the nest itself is composed, by means of the mucous excretion which exudes from their bodies. To make sure that all parts of the nest are united with sufficient solidity, the fish suspends himself in the water immediately above it, with his head downwards, and makes rapid vibrations with his pectoral fins and his tail. By this means, any parts of his dwelling which are not properly constructed at once become loose and detached, and he instantly darts down and repairs the defect.

"During an entire month, he is the sole guardian of the eggs which the females lay within, and he has to defend them, not only against the attacks of other fishes, but against the ferocious and unnatural appetites of the parents themselves. He removes the stones which accumulate at the mouth of the nest, he enlarges the opening, and by the singular vibrations of his tail and fins, he changes and purifies the water in the neighbourhood, and in short he never relaxes his care of the young until they are fully able to provide for themselves."

The Ten-spined Stickleback [*] is often called "the Tinker," and the Fifteen-spined one,[†] the "Sea Adder."

There are two fishes in Demerara, the Flat-headed Hassar,[‡] and the Round-headed Hassar,[§] which make nests like the sticklebacks. Sir Richard Schomburgh, when recounting his "Travels in British Guiana," states that not only does the hassar form a perfect nest for its spawn of all kinds of fibres from among the aquatic plants, but it watches, with the most active maternal care, till the young brood escape. The nest, like that of the magpie, is a real work of art. In April the hassar begins forming the nest, until it resembles a hollow globe flattened at the poles, the upper one of which reaches the surface of the water. An orifice, adapted to the size of the mother, opens into the interior. The negroes frequently capture the hassars, by putting their hands in the water, close to the nest; when the guardian parent, rushing to a repulse of the invader, is dexterously seized and thrown on the land.

These two fishes, so much alike in their habits, exhibit a remarkable difference in the material of their nests; the flat-headed hassar using leaves, and the round-headed forming its fabric of grass. At certain seasons they burrow in the bank, and it is only in the rainy season that they make their nests and lay their eggs. "Often have I been surprised," says Dr. Hancock, "to observe the sudden appearance of numerous nests in a morning after rain occurs, the spot being indicated by a bunch of froth which appears on the surface of the water over the nest. Below this the eggs are placed on a bunch of fallen leaves or of grass (the round head of grass, the flat head of leaves) which they cut and collect together. By what means this is effected seems rather mysterious, as they are destitute of teeth. It may possibly be by the use of their serrated arms, which form the first ray of the pectoral fins."

Agassiz alludes to a nest-building fish, which he observed in Lake Sebago, in the State of Maine; and others have been observed in Australia. Thus, Mitchell says, in his work on "Tropical Australia," "In a dry part of the river (Maranoa), I met with many instances of the singular habit of the Eel-fish, or Jew-fish.[||] I had previously observed elsewhere, in the aquatic reeds growing in extensive reaches, clear circular openings, showing white parts of the bottom, over which one or two fishes continually swam round in circles. I now found on the dry bed that such circles consisted of a raised edge of sand, and were fitted with stones, some as large as a man's closed fist. Suranigh, a native, told me that this was a nest of a pair of these fish, and that they carried the stones there and made it. The general bed of the river, where we saw these nests, consisted wholly of deep, firm sand, and that the fish had some way of carrying the stones to such spots seemed evident."

THE BULL-HEAD, OR MILLER'S THUMB.

To the family of hard-cheeked fishes belongs that well-known little tenant of rivers and rivulets, the Bull-Head, or Miller's Thumb,[¶] common over the whole of Europe, and noted for hiding itself among loose stones, in the bed of the bubbling stream. The head of the fish is smooth, broad, and rounded, and is said to resemble exactly the form of the thumb of a miller, as produced by a peculiar and constant action of the muscles in the exercise of a particular and most important part of his occupation.

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[*] Gasterosteus pungitius.

[†] G. spinachia.

[‡] Doras costatus.

[§] Callichthys littoralis.

[||] Plotosus tandanus.

[¶] Cottus gobio.

The father of the late John Constable, Esq., R.A., was a miller, and our eminent English painter described to Mr. Yarrell this singular form of the human thumb.

"It is well known," he says, "that all the science and tact of a miller is directed so to regulate the machinery of his mill, that the meal produced shall be of the most valuable description that the operation of grinding will permit, when performed under the most advantageous circumstances. His profit or his loss, even his fortune or his ruin, depend upon the exact adjustment of all the various parts of the machinery in operation. The miller's ear is constantly directed to the note made by the running-stone in its circular course over the bed-stone, the exact parallelism of their two surfaces, indicated by a particular sound, being a matter of the first consequence; and his hand is as constantly placed under the meal-spout, to ascertain by actual contact the character and qualities of the meal produced.

"The thumb, by a particular movement, spreads the sample over the fingers; the thumb is the gauge of the value of the produce, and hence has arisen the sayings of 'Worth a miller's thumb,' and 'An honest miller hath a golden thumb,' in reference to the amount of the profit that is the reward of his skill. By this incessant action of the miller's thumb, a peculiarity in its form is produced, which is said to resemble exactly the shape of the head of the fish constantly found in the mill-stream, and has obtained for it the name of the Miller's Thumb, which occurs in the comedy of 'Wit at Several Weapons,' by Beaumont and Fletcher, and also in Merrett's 'Pinax.'

"Although the improved machinery of the present time has diminished the necessity for the miller's skill in the mechanical department, the thumb is still constantly resorted to as the best test of the quality of the flour."

To another family * belong the Sea-Breams, of which we notice two which are remarkable.

THE COMMON SEA-BREAM.†

This fish, often called the Red Gilt-Head, is common in the Mediterranean, and tolerably abundant on the western and southern coasts of England, and on adjacent coasts of France. It occurs also on many parts of the Irish coast. During the summer and autumn, it is frequently taken by the Hastings fishermen, and may be seen in the fish-market. It is, however, in but little request for the table. Its teeth are well adapted for masticating sea-weeds, and crushing crabs and shell-fish, on which the sea-bream chiefly feeds.

The general colour of this fish is reddish, tinged with gray, passing into golden gray on the sides, and white underneath. At the origin of the lateral line, behind the edge of the gill covers, is a dusky patch, consisting of closely set spots or prickles. Two narrow stripes on each side behind the head meet above in the central line, and faint longitudinal bands run along the sides of the body. Pectoral fins and tail red, the other fins brownish. The young fish, called chads, are destitute of the lateral dusky spot. This fish breeds in winter, and during the spring and summer shoals of chads, about six inches in length, abound along our coast.

THE FOUR-TOOTHED SPARUS.‡

As a Mediterranean species, this fish is exceedingly well known. It is remarkable for the great length of the four anterior teeth in each jaw. It has been caught off Hastings, and is believed to be the *Dentex* of the Romans.

This fish sometimes acquires a large size, as, for example, the length of three feet, and the weight of from twenty to thirty pounds. One is mentioned as weighing no less than seventy pounds.

"A more voracious fish," says Dovovan, "is scarcely known; and when we consider its ferocious inclination, and the strength of its formidable canine teeth, we must be fully sensible of the great ability it possesses in attacking other fishes, even of superior size, with advantage. It is asserted that when taken in the fishermen's nets, it will seize upon the other fishes taken with it, and mangle them dreadfully. Being a swift swimmer, it finds abundant prey, and soon attains to a considerable size. Willughby observes that small fishes of this species are rarely taken; and the same circumstance has been mentioned by later writers. During the spring it prefers deep waters; but in the spring, or about May, it quits this retreat, and approaches the entrance of great rivers, where it deposits its spawn between the crevices of stones and rocks.

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* Sparidæ.

† Pagellus centrodentatus.

‡ Dentex vulgaris.

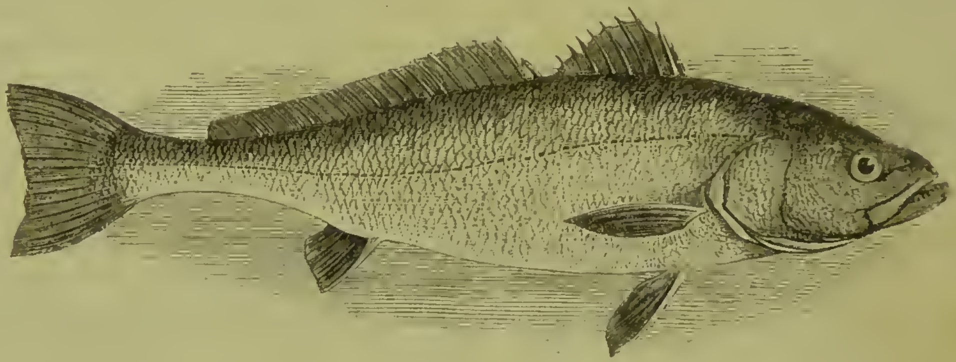
"The fisheries of this kind of sparus are carried on upon an extensive scale in the warmer parts of Europe. In the estuaries of Dalmatia and the Levant, the capture of this fish is an object of material consideration, both to the inhabitants generally, as a wholesome and palatable food, when fresh, and to the mercantile interests of those countries, as an article of commerce. They prepare the fish, according to ancient custom, by cutting it in pieces, and packing it in barrels, with vinegar and spices, in which state it will keep perfectly well for twelve months."

The form of the head of this fish is obtuse. The back is of a brownish red, slightly mottled with some dark spots; the sides paler, and inclining to yellow; the belly almost white. This fish is said to become of a greenish purple tint by age, and to be paler in colour during winter.

Another family* includes the Maigres; one of which has become highly celebrated.

THE MAIGRE.†

The appearance of this fish on our coast is accidental; it is most abundant along the southern side of the Mediterranean, but is taken off the shores of Spain, France, and Italy. At Genoa, it is termed *fegaro*, and at Nice, *figou* and *vanloo*. The maigre is gregarious in its habits, swimming in shoals, which utter a purring noise so loud as to be heard from a depth of twenty fathoms; and from this circumstance, the fishermen are often enabled to take several in their net with certainty, their noise betraying their exact locality. Their capture, however, is not a very safe or easy task, for the maigre is from three to six feet and upwards in length, very strong and resolute, and it struggles with the utmost desperation, knocking the men about, till one of them can manage to strike it a heavy blow on the head, and so deprive it of life. "Rondeletius," observes Mr. Yarrell, "calls this species *peis rei*,‡ (royal fish). It appears always to have been in great request with epicures; and as, on account of its large size, it was always sold in pieces, the fishermen of Rome were in the habit of presenting the head, which was considered as the finest part, as a sort of tribute to the three local magistrates, who acted for the time as conservators of the city." It is the umbrina of the ancient Romans. The umbrina is of a general silvery gray, inclining to brown on the back, and pure silver on the under parts; the fins are reddish. There are two dorsal fins.



THE MAIGRE.

Allied to the maigre are some fish§ remarkable for their great size, and the noise they send forth, and which has led to their being called *drums*. According to Dr. Mitchill, it is when they are taken out of the water that they send forth this noise: but Schœpf says that it is under the water; that this noise is dull and hollow; that several individuals assemble round the keel of ships at anchor, and that then their noise is most sensible and continuous. This account may seem extraordinary, yet it is perfectly conformable with the following statement:—

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* Sciænidæ.

† Sciæna aquila.

‡ It is termed *peisrey* in Languedoc.

§ Pogonidæ.

Lieutenant White relates, that being at the mouth of the river of Cambodia, his crew and himself were astonished by some extraordinary sounds which were heard around the bottom of their vessel. "It was," he says, "like a mixture of the bass of the organ, the sound of bells, the guttural cries of a large frog, and the tones which imagination might attribute to the largest harp; one might have said the vessel trembled with it." These noises increased, and finally formed a universal chorus over the entire length of the vessel and the two sides. In proportion as they went up the river, the sounds diminished, and finally ceased altogether. The interpreter told Lieutenant White that they were produced by a troop of fishes of an oval and flattened form, which have the faculty of strongly adhering to various bodies by the mouth.

M. Humboldt met with a similar fact, but without suspecting the cause. One evening, towards seven o'clock, the whole crew were astonished by an extraordinary noise, which resembled that of drums beating in the air. At first it was attributed to the breakers. Speedily it was heard in the vessel, and especially towards the poop. It was like the noise of the air which escapes from fluid in a state of ebullition. Those on board began then to fear there was a leak in the vessel. The noise was heard unceasingly in all parts of the ship, till about nine o'clock it ceased altogether.

The drums, according to Dr. Mitchill, swim in numerous troops, in the shallow bays on the south coast of Long Island, where the fishermen find them during the summer. Schœpf says that they are found in still greater abundance, and during the whole year, along the coasts of Carolina and Florida.

Some other creatures, having a similar power, are alluded to by Sir Emerson Tennent. He states that when visiting Batticaloa, on the north of Ceylon, he made inquiries relative to the musical sounds alleged to issue from the bottom of the lake. The fishermen vouched for the truth of the story, stating that the sounds are heard only during the dry season, and cease when the lake is swollen by the fishes after rain.

"In the evening," says Sir Emerson, "when the moon had risen, I took a boat and accompanied the fishermen to the spot. We rowed about two hundred yards north-east of the jetty, by the fort gate. There was not a breath of wind, and not a ripple, but that caused by the dip of our oars; and on coming to the point already mentioned, I distinctly heard the sounds in question.

"They came up from the water like the gentle thrills of a musical chord, or the faint vibrations of a wine-glass when its rim is rubbed by a wet finger. It was not one sustained note, but a multitude of tiny sounds, each clear and distinct in itself; the sweetest treble mingling with the lowest bass. On applying the ear to the wood-work of the boat, the sound was greatly increased in volume by its conductor. They varied considerably at different points as we moved across the lake, as if the number of animals from which they proceeded was greater in particular spots; and occasionally we rowed out of hearing of them altogether, until, on returning to the original locality, the sounds were at once renewed.

"This fact seems to indicate that the causes of the sound, whatever they may be, are stationary at their several points; and this agrees with the statements of the natives, that they are produced by mollusca, and not by fish."

THE BEARDED UMBRINA.*

This species, allied to the maigre, has a short barbule at the tip of the lower jaw, inhabits the same seas as that fish, and is also celebrated for the excellence of its flesh. It is, however, much smaller than the latter, seldom exceeding two feet in length. It is covered with large scales. The general hue of the body is yellowish, with oblique lines on each side, from the back downwards, and forwards of silver and blue.

THE MACKEREL.

This fish was known to the Greeks, by a name† from which the generic term for all fish comprised in this class has been derived, *Scomberidæ.* The name given to the Mackerel by the French, German, and Dutch, as well as by the English, is derived from the Latin word *macula*, a spot; that is, the spotted or streaked fish. Hence the term "mackerel-sky" is often applied to a well-known arrangement of the clouds.

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* Umbrina vulgaris.

† σκόμβρος.

The mackerel is, perhaps, the most beautiful of our British fishes, being elegant in its form as well as brilliant in its colour. The back is varied with hues of fine green and rich blue, and is marked by broad transverse lines of a dark colour. "The males," says Donovan, "have these dark transverse bands nearly straight; while in females these bands are elegantly undulated." The colours are much richer when the fish is first taken out of the water; but even when exhibited on fishmongers' stalls, they are still brilliant. The scales are small and smooth; while some of the posterior rays of the second back, and the caudal or tail-fin, form very small-sized fins. The weight of the mackerel is generally under two pounds; but Pennant mentions one sold in London which weighed five pounds and a quarter. The ordinary length is fourteen or sixteen inches, but some are found of the length of twenty inches.

A light gale, which gently ripples the surface of the water, and is called a mackerel gale, is most favourable to the fisherman, who chiefly follows his employment during the night. There are three modes of fishing: with drift-nets, with seans, and with the line. By the latter mode a couple of men will take from 500 to 1,000 mackerel in one day, if the weather be favourable. The French boats frequently go out with six or eight people on board, all of whom fish with the line; and some of them are sufficiently adroit to pay attention to a couple of lines at the same time.

THE MACKEREL.

The fish bite voraciously, and are taken with great rapidity by a bait cut from its own kind, and made to resemble a living fish. They will seize, and may be taken by, a piece of scarlet cloth or leather; and a scarlet coat has therefore been termed "a mackerel bait for a lady."

The sean-fishing requires two boats. The sean, however, is sometimes hauled on shore. The drift-net fishing is the most common, and by this mode a larger number of fish can be taken than in any other way. According to Mr. Yarrell, the drift-net is twenty feet deep by 120 feet long, well corked at the top, but without lead at the bottom. They are made of small fine twine, which is tanned of a reddish-brown colour, to preserve it from the action of the sea-water; and it is thereby rendered much more durable. The size of the mesh is about two inches and a half, or rather larger.

Twelve, fifteen, and sometimes eighteen of these nets are attached lengthways, by tying along a thick rope, called the drift-rope, and, at the ends of each net, to each other. When arranged for depositing in the sea, a large buoy attached to the end of the drift-rope is thrown overboard, the vessel is put before the wind, and, as she sails along, the rope, with the nets thus attached, is passed over the stern into the water till all the nets are run out. The net thus deposited hangs suspended in the water perpendicularly twenty feet from the drift-rope, and extending from three quarters of a mile to a mile, or even a mile and a half, depending on the number of nets belonging to the party or company engaged in fishing together. When the whole of the nets are thus handed out, the drift-rope is shifted from the stern to the bow of the vessel, and she rides by it as if at anchor.

The benefit gained by the boat's hanging at the end of the drift-rope is, that the net is kept strained in a straight line, which, without this pull upon it, would not be the case. The nets are shot in the evening, and sometimes hauled once during the night; at others allowed to remain in the water all night. The fish, roving in the dark through the water, hang in the meshes of the net, which are large enough to admit them beyond the gill-covers and pectoral fins, but not large enough to allow the thickest part of the body to pass through.

Early in the morning, preparations are made for hauling the nets. A capstan on the deck is manned, about which two turns of the drift-rope are taken. One man stands forward to untie the upper edge of each net from the drift-rope, which is called "casting off the lashings;" others hand in the net with the fish caught, to which one side of the vessel is appropriated; the other side is occupied by the drift-rope, which is wound in by the men at the capstan.

The arrival of the mackerel shoals produces no little bustle and excitement in the various fishing towns of our coast; every boat's crew strives to be foremost, for the first cargoes are of the highest value. All, in fact, is animation—the arrivals and departures of boats give life to the port; nor are the men on shore less occupied and active than the fishermen in the offing.

The following passage from Mr. Yarrell's work will show the causes of the bustle and excitement at this juncture:—

"In May, 1807, the first Brighton boat-load of mackerel sold at Billingsgate for forty guineas per hundred—seven shillings each, reckoning six score to the hundred; the highest price ever known at that market. The next boat-load produced but thirteen guineas per hundred. Mackerel were so plentiful at Dover, in 1808, that they were sold sixty for a shilling. At Brighton, in June of the same year, the shoal of mackerel was so great, that one of the boats had the meshes of her nets so completely occupied with them, that it was impossible to drag them in; the fish and nets, therefore, in the end, sank together; the fishermen thereby sustaining a loss of nearly £60, exclusive of what the cargo, could it have been got into the boat, would have produced. The success of the fishery of 1821 was beyond all precedent. The value of the catch of sixteen boats from Lowestoft, on the 30th of June, amounted to £5,252; and it is supposed that there was no less an amount than £14,000 altogether realised by the owners and men concerned in the fishery of the Suffolk coast. In March, 1833, four Hastings' boats on one day brought on shore ten thousand eight hundred mackerel, and the next day two boats brought seven thousand fish. Early in the month of February, 1834, one boat's crew from Hastings cleared £100 by the fish caught in one night, and a large quantity of very fine mackerel appeared in the London market in the second week of the same month. They were cried through the streets of London three for a shilling, on the 14th and 22nd of March, 1834, and had then been plentiful for a month. The boats engaged in fishing are usually attended by other fast sailing vessels, which are sent away with the fish taken. From some situations these vessels sail away direct for the London market; at others, they make for the nearest point from which they can obtain land-carriage for their fish. From Hastings and other fishing towns on the Sussex coast, the fish are brought to London by vans, which travel all night."

The seasons fluctuate considerably, an abundant year being succeeded by a scarce one; or several of the latter may occur together, and be followed by successive years of plenty. On some nights two or three thousand fish will be caught by one boat, while another, not more than a mile distant, may not take one hundred. This uncertainty contributes to render the fishing a precarious source of subsistence to those who can embark capital in it only on a small scale, and cannot stand against the unforeseen reverses which may occur in a short period, but which, on an average of years, are counterbalanced.

When taken out of the water, the mackerel dies almost instantly. Few of these fishes are salted in England, but in France great numbers are used thus prepared. The spring fishing-boats carry out salt with them for this purpose, and cure the fish on board. Young mackerel of the year are called "shiners." Excluded from the egg in May or June, they increase rapidly in size, and by the middle of autumn are from four to six inches long. On the approach of winter they retire to deep water.

A Dutch auction may sometimes be witnessed on the beach of an active fishing town. The mackerel are separated into heaps as soon as they are landed; and the persons desirous of purchasing being assembled, one of the fishermen or owners of the boat acts as salesman, and names a price above the real value, while he raises a large stone with which to "knock down" a lot. A lot, which may ultimately sell at forty shillings, is offered at sixty shillings, the salesman rapidly naming a lower price until he gets a bid, when the stone falls to the ground, and the first bidder becomes the purchaser. This descending instead of an ascending scale enables the sellers to get through their work more quickly, and it is, perhaps, the fairer, for the price approaches nearer the actual worth than when feelings of rivalry are allowed to display themselves.

THE TUNNY.[*]

THIS far-famed fish, common in the Mediterranean, occasionally visits our coasts, and a few are captured from time to time, and sent into the market for sale.

The Tunny attains to a considerable size; and though small specimens, of three or four feet in length only, are most usually taken in our seas, yet specimens of ten, fifteen, or eighteen feet in length are not uncommon in the Mediterranean. "This fish," says Cuvier, "may be regarded as constituting a portion of the wealth of Provence, Sardinia, and Sicily." The tunny fishery, as in the days of antiquity, is most important, and its flesh maintains its pristine reputation.

In May and June, the tunny, in vast shoals, leaves the deep water, and approaches the shore, which it skirts along, seeking for convenient breeding places; and now along the coasts of Languedoc, Provence, and Sicily, begin the fishery, and all is animation and excitement. Two modes are employed. On the signal being given, by a sentinel stationed for the purpose, of the approach of a shoal of these valuable fishes, and who at the same time indicates its course, a number of boats, under the command of a leader, station themselves so as to form part of a circle, and join their nets, adding more and more nets as may be required, till the terrified fish are hemmed up in an inclosure, which is gradually drawn towards the shallow water, near the edge of the shore. Here a large net, with a cone-shaped tunnel, is made use of to receive the fish, and is dragged upon the beach with its heavy burden. The young and small tunnies are, however, taken out in the arms of the fishermen, and the large ones are killed with poles.

The other mode is called in Italian *tonnaro*, and in Provence *madrague*. Parallel with the shore, along which the shoals take their course, a net, extending for a mile, is fixed vertically, by means of corks along its upper margin and weights along its lower edge, and kept in its position by anchors. It thus forms a sort of netted wall. From this wall to the coast are drawn numerous cross nets, dividing the space into many chambers, having narrow openings of communication on the land side. Proceeding along, between the long net wall and the shore, the fishes are soon stopped by one of the cross nets; instead of turning back, they enter into the chamber by the narrow opening left for them; having entered, they are driven by the fishermen from chamber to chamber till they enter the last, which is floored with a strong net, so fixed as to be capable of being raised or lowered. About this chamber of death, the fishermen, armed with long poles, collect in boats, and the unequal conflict begins. The net flooring is raised; the floundering of the devoted tunnies, the shouts of the men, the splashing of the long poles, as they rain blows on the crowded fish, constitute a scene which forms one of the greatest amusements of the people of Sicily and the southern coast of France. The flesh of the tunny is red, and as firm as veal. It is dressed in various ways. Slices are boiled or fried. It is made into ragouts; it is put into pies, or *pâtés*, celebrated by the epicures of France; it is converted into a sort of pickle, with salt and oil; and this preparation, under the term of *thon mariné*, is eaten cold. It is also cured by being cut into slices, and packed in barrels with pounded salt.

In its general figure the tunny resembles a huge mackerel, but with a shorter head. The colour of the upper parts of the body is dark blue; numerous large scales of a paler colour form a corslet around the thorax or chest; the sides of the head are white; the under parts are gray, variegated with silvery white markings. The first dorsal fin, the pectoral and ventral fins, are black; the rest pale pink, with a silvery tinge; tail-fin dusky; the sides of the tail are carinated, crooked, or bent like the keel of a ship. Several allied species, as the Alicosti, the Tonine, are found in the Mediterranean. The Bonito of the tropics belongs to the same genus.

There is another fish taken in the Mediterranean with the tunny, distinguished as the representative of a distinct genus only by the enormous length of its pectoral fins. This fish is called *La Germon* in the Basque language, and *Alalonga* by the Italians.[†] In spring and summer vast shoals of this fish enter the Gulf of Gascony, where immense numbers are regularly taken. This fish often weighs eighty pounds; its flesh is more white than that of the tunny. It is of a dark blue above, passing into silvery on the under surface.

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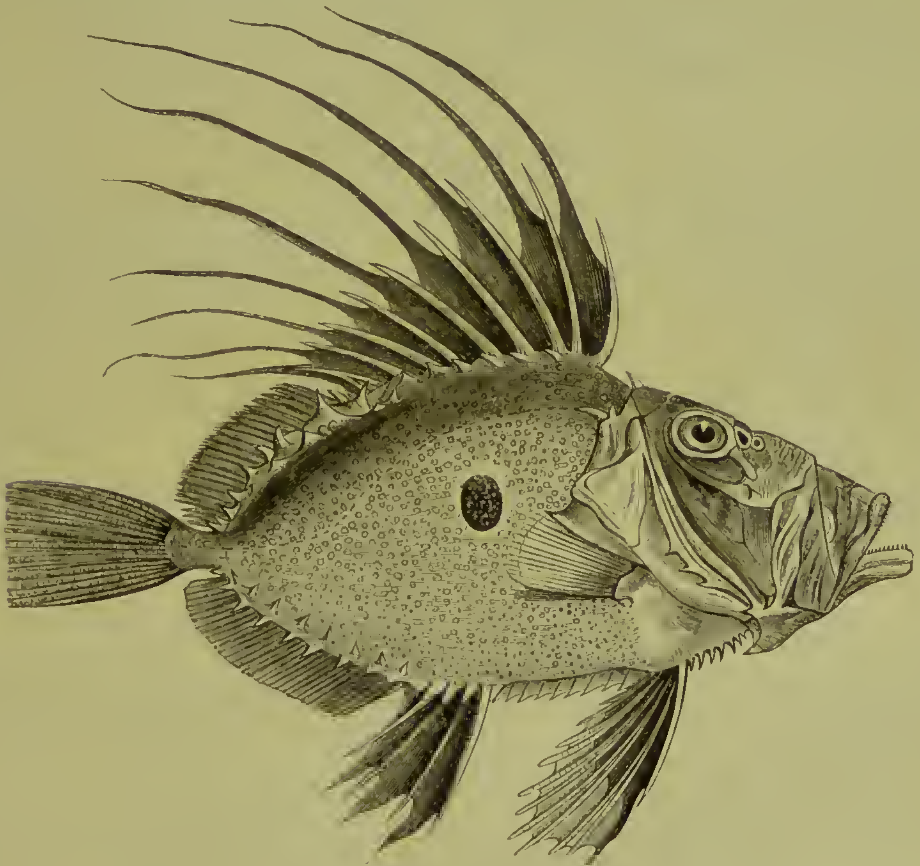
[*] Thynnus vulgaris.

[†] Orcynus alalonga (Cuvier).

On various parts of our coast, especially the southern, a fish called the Scad, or Horse-mackerel,* is often very abundant, and occasionally seen in enormous shoals. In July, 1834, as Mr. Yarrell informs us, most extraordinary shoals passed up the channel along the coast of Glamorganshire; their passage occupied a week, and they were evidently in pursuit of the fry of the herring. The water appeared one dark mass of fish, and they were caught by cart-loads, and might even be baled out of the water by the hands alone.

In the west of Cornwall scad are caught and salted like mackerel, for winter consumption; but in other places the fishermen do not deem them worthy of any especial notice, nor do they often appear in the London markets, as they are very inferior to the mackerel; occasionally, however, they are to be purchased. The scad averages twelve or fourteen inches in length; the body is covered with small scales, with the exception of the lateral line, which exhibits a series of large, broad scales, producing a singular appearance; those more especially of the posterior half of the body have a central ridge or keel, and each overlapping margin in succession is pointed. The appearance is as if a stripe of plate-armour ran along each side of the body. The general colour above is dusky olive, with iridescent green, and a bluish wavy gloss; the sides of the head and the surface below the lateral line are silvery, with waved reflections; a large spot on the gill-covers and the throat are black; upper fins dusky; lower fins whitish.



THE JOHN DORY.

THE JOHN DORY.†

John Dory, as the name of a fish, may be a corruption of the Italian *janitore*, or the gate-keeper; or the French *Jaune dorée*, or gilded yellow. Pennant calls it the *Doree.* It was known to the ancients by the name of Zeus or Jupiter.

The head of this fish is large and inelegant; the body is much compressed and of an oval form; the spines of the first dorsal fin are projecting, and accompanied by long filaments, and there are spinous scales along the dorsal and ventral edges. The mouth is armed with numerous teeth, and capable of great protrusion. The general colour of the body is olive brown, tinged with golden yellow, and with reflections of blue and silver on each side; a little behind each gill-cover is a circular mark of black. As its form sufficiently indicates, the Dory is by no means rapid in its movements; it wanders leisurely through the deep water, often drifting with the current, though it can, doubtless, exert itself vigorously enough when prompted by its appetite.

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* Caranx trachurus

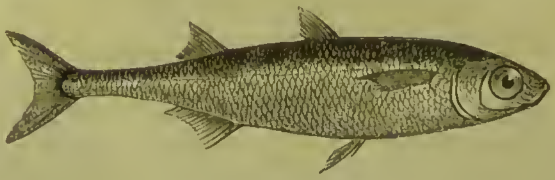
† Zeus faber.

On our coasts it is found along Hampshire and Sussex, Cornwall and Devonshire; occasionally it is taken off Yarmouth, and more rarely still further north. It visits some part of the Irish coast, but not, we believe, in abundance. It is said to follow the shoals of pilchards, on which it preys; it also devours small cuttle-fish. The John Dory is taken from boats. The bait consists of mussels, sand-worms, cockles, and herrings cut up. Autumn and winter are the principal seasons in which it is taken; its flesh is firm, and regarded as improved by keeping for a few days.

The correct way to dress dories is simply to boil them; unless when small, they are seldom fried; a large one may occasionally be stewed, but boiling is decidedly the prevailing method of dealing with them both at home and abroad. In Italy, equals parts of wine and water are used in the cooking, and "John" is usually served cold, with a sauce of lemon juice and oil, and a sprinkling of salt and pepper.

THE BOAR-FISH.*

This fish, in its general appearance, is not unlike the John Dory, to which it is, in fact, closely allied. It appears to be usually about six inches in length, of a pale carmine colour above, and silvery white beneath. The colour of the upper part extends more or less down the sides of the body, and sometimes orange-coloured bands are observable extending from the back downwards. The lateral line is not readily seen, except in recent specimens, when it is said to have a crystalline appearance. The Boar-Fish is a native of the Mediterranean, and has been found on our own coast, but very rarely.



THE SAND SMELT.

THE ATHERINE.†

Along some parts of our southern coast, and especially that of Hampshire and Sussex, and also of Devonshire and Cornwall, a fish called the Atherine, or Sand Smelt, sometimes confounded with the True Smelt,‡ and sold as such at Southampton, is very abundant. It possesses in a slight degree the cucumber smell of the true smelt, and though far inferior to the latter, is nevertheless, when in full roe, a delicate little fish; in spring it is in perfection, but great numbers are caught during the winter months, and throughout this season Brighton and other towns on the same line of coast are plentifully supplied.

The atherine prefers quiet sandy bays and tranquil water, to the turbulent deep, and in stormy weather numbers are occasionally washed on shore.

Various modes of fishing are adopted in the capture of this silvery little fish, but the most common way is by means of a sweep-net with small meshes, by which the shoal is inclosed. In the atherine, the first dorsal fin has eight spring rays, the second one spring ray, and twelve cartilaginous. In the true smelt, the second dorsal fin is rayless and fleshy as in the salmon. The general colour of the atherine along the sides is of a glistening silvery white. The upper part of the back and head are sprinkled with small blackish spots. Common as this fish is, it is not very frequently brought to the London market, which is abundantly supplied with the true smelt.

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* Capros aper.

† Atherina presbyter.

‡ The True Smelt belongs to the Salmon and Trout family.

THE WOLF-FISH.*

Occasionally in the fish-markets or shops in London are to be seen specimens of this ferocious-looking fish, sometimes called the Wolf-Fish, or Sea-Wolf. It belongs to the family of the Gobies.†

This strange, repulsive fish has an elongated body covered with small scales; a long dorsal fin extends down the whole of the back. There are no ventral fins, and the pectorals are comparatively small, the head short and rounded, and the markings of it, together with the position of the glaring eyes, and the long, sharp, curved front teeth, give it a fierce, cat-like expression. The back teeth and those of the palate are in close array, thick and tubercular, or rounded, and well adapted for crushing crabs, lobsters, and shell fish. One of these fishes, of about four feet long, the writer lately saw in London. It attains, however, to the length of six or eight feet, or even more. The wolf-fish is a native of the high northern seas, and is common along the shores of Greenland and Iceland: yet it not unfrequently appears on different parts of our coast, especially those of Scotland, Yorkshire, &c., and it is far from being uncommon among the Orkneys.

Notwithstanding its repulsive appearance, the flesh of this fish is a delicacy. In the countries of Norway, Sweden, &c., the head and the thick slimy skin are removed previously to any culinary operations, and the latter is converted into serviceable bags, and other articles.

The wolf-fish is really as ferocious as its aspect indicates. When inclosed in a net, either by accident, or by the temptation which the imprisoned crowd offers to its voracity, it makes, on discovering its peril, the most desperate efforts for escape; it rushes against the meshes, endeavouring to break through; it tries to rend the cordage, and often succeeds; and, should it fail, it fights and snaps with tremendous fury, even when hauled on board the boat, struggling till the blow of a heavy handspike on the head deprives it of motion or existence.

From the length of the body the fish swims with an undulatory motion, and with great vigour; the female deposits her eggs near the shore, in June. The general colour of this tyrant of the seas is brownish gray, with darker vertical bands on the back, and intermediate spots; the under surface is whitish; a triangular, dusky mark occupies the top of the head, pointing between the eyes.

THE COMMON ANGLER.‡

The Common Angler, or Fishing Frog, is taken in a calm from boats or vessels at sea, on the hooks of long lines, with a piece of dog-fish or a herring for a bait. This very curious fish is usually about three feet in length, but has been known to measure five feet. The head is wide, and the mouth nearly as wide as the head; the eyes are large, the pupils black; the lower jaw, which is the longer, is bearded or fringed all round the edge; and both jaws are armed with numerous teeth; the body is narrow, compared with the breadth of the head, and tapers gradually to the tail. The whole fish is covered with a loose skin. The colour of the upper surface of the body is uniform brown; the under surface of the body, the ventral and pectoral fins white, and the tail almost black.

On the top of the head are three long filaments; of these, two are seated just above the muzzle, the other rises from the back of the head. These filaments are supported by bone, and movable in all directions, especially the first, which, tapering like the finest fishing-rod, ends in a broad, flattened, silvery tip. The pectoral fins are broad and thick, and serve the place of hind feet, for the ventral fins are placed far anterior to them on the body.

The angler is insatiably voracious, but it is a slow swimmer; it is formed, in fact, for taking its prey in ambush. It reposes on the soft mud or sand, in some favourable lurking-place, and, stirring up the mud with its pectoral fins, thus obscures itself in a murky cloud, beyond which appear its long filaments, and, especially the first, with its glittering tip, offering an attractive bait to other fish: Thus stationed, this creature quietly expects its victim. On rove the shoals of fish, eager in quest of food. They pass one after another in succession, till at length one espies the bait. Forwards the fish darts, either to examine or seize the expected prize; but at that instant, aided by the broad, feet-like pectoral fins, the watchful angler springs up, and captures his prey. Such is the success of this voracious tyrant, that the fishermen examine its stomach, and sometimes obtain from it a considerable number of serviceable fish yet alive, which it had just swallowed. It is not, however, always that the angler thus obtains his food; he is sometimes seen floating on the surface, ready to snap at whatever prey comes within his sudden dart.

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* Anarrichas lupus.

† Gobioidæ.

‡ Lophius piscatorius.

THE COMMON ANGLER, OR FISHING FROG.

The Blennies* constitute another genus. Both the Greek and the French names have been applied to this genus, from the mucous matter with which the bodies of these fishes are covered.

THE OCELLATED BLENNY.†

This species, called also the Butterfly Fish, is taken with a rod and fine line from the rocks, and from shallow pools, at low water. It is scarcely three inches long; the head is rounded, the part before the eyes very short, and above the eyes are two slender appendages. The body is of a pale brown colour, varied with patches of a deeper hue; the pectoral and ventral fins are darker than the others. This species frequents the coast of Devonshire and elsewhere, as the rocks about the Isle of Portland. It hides among the weeds and in the crevices of rocks, and is very tenacious of life. There are some other blennies, as the Crested, the Gattoruginous, the Diminutive, and the Shanny. All the species are remarkable for the facility with which they use the ventral fins, for enabling them to cling to and move about upon the rocks and stones by which they are surrounded.

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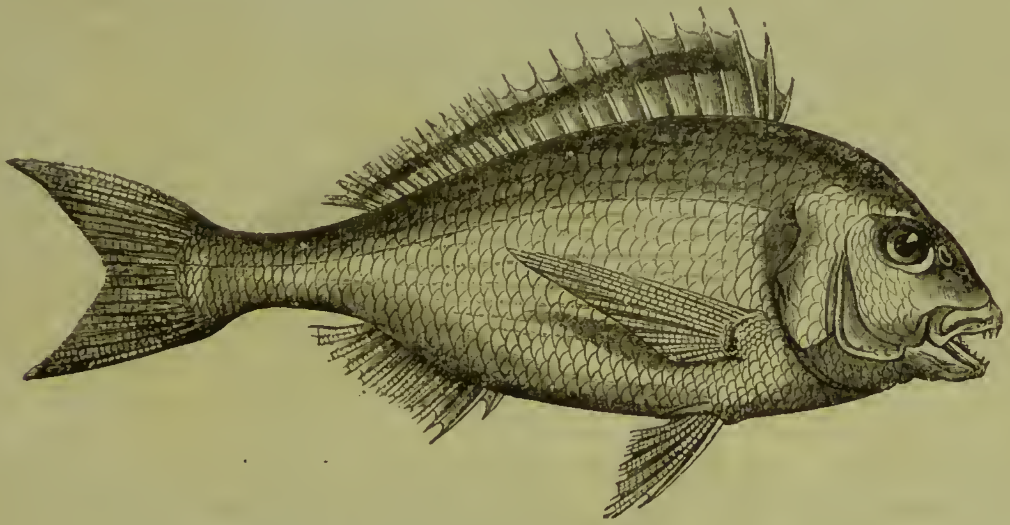
* Blennius French, Baveuses.

† Blennius ocellaris.

The species of another genus* are distinguished by having the margin of the pre-operculum denticulated; the cheeks and operculum are scaly.

THE BALLAN WRASSE.†

This fish is not unfrequently met with on various parts of our coast. It is about eighteen inches long of a red colour above, pale orange beneath, and adorned with bluish green oval spots; the fins and tail are green, with a few red spots; the dorsal fin is spotted at the base. The length of the head, compared to the whole length of the fish, is as one to four, and the depth of the body is equal to the length of the head.



THE GILT HEAD.

THE RAINBOW WRASSE.‡

The Rainbow Wrasse has been caught off the British coast; but, though well known in the Mediterranean, it appears here to be scarce. It is of a slender and elongated form, and remarkable for the elegant distribution of its colours, which change according to the light and position. On each side of the body is a broad dentated stripe, extending from the head nearly to the tail, of a silvery and fulvous colour.

THE GIBBOUS WRASSE.§

The Gibbous Wrasse may be easily distinguished from others by its comparatively shorter and more elevated form. The depth of the body is considerably more than one-third of the length: the colours are chiefly orange and blue; the gill-covers and sides of the body are spotted, and the back is striped. The ventral fins are green, the pectorals are yellow, with transverse red stripes at their base. Other Wrasses are found, as the Green-streaked Wrasse, the Blue-striped Wrasse, the Red Wrasse, and the Scale-rayed Wrasse.

THE GILT HEAD.

This fish, called also the Connor, or Golden Maid, is found on various parts of the coast. It is about six inches long, and the depth is nearly one-third of the length. The general colour of the body is obscure red and green; these colours are arranged in longitudinal stripes on the upper parts, and beneath the lateral line the red is disposed in spots. The Gilt Head mostly frequents deep water, where the bottom is rocky; its food is chiefly crab-like creatures.

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* Crenilabrus. † Labrus maculatus. ‡ Julis Mediterranea. § Crenilabrus gibbus. || Crenilabrus melops.

THE GOLD SINNY.*

The Gold Sinny, or Corkwing, as this fish is sometimes called, somewhat resembles the last, but may always be distinguished by a black spot on each side, near the base of the tail, and situated on the lateral line. Its general colour is yellowish green, darkest on the back; the sides are usually adorned with longitudinal lines of a deeper hue. The length is about three or four inches.

Another family † will be found very remarkable. The peculiar structure of their pharyngeals, by which a quantity of water can be retained in their complicated folds, is compared by Cuvier to the leaflets of a camel's paunch. The apparatus is covered by convex gill-covers, that fit closely to the shoulders; so that even when the fish is out of the water, the inclosed liquid cannot evaporate quickly, but remains falling, drop by drop, on the *branchiæ*, and keeping them sufficiently moist to carry on the oxygenation of the blood.

In conformity with this speciality in the form of these organs is the known habit of all the members of the family, whose mode of life has been ascertained, of issuing at times from the rivers and ponds, and travelling overland to considerable distances.

THE TREE CLIMBING FISH. ‡

The general character of these curious fishes was known to the ancients. Theophrastus, in one of his treatises,§ says that in India there are certain little fishes which leave the rivers for a time and return to them again, and that they resemble the fishes named by the Greeks *Myxinos*, or the Mullets.

M. de Daldorf stated to the Linnæan Society that he had himself taken an *Anabas* in the act of ascending a palm-tree, || which grew near a pond. The fish had reached the height of five feet above the water, and was going still higher. In the effort to do this, it held on by the bark of the tree, by the pre-opercular spines, bent its tail, and stuck in the spines of the anal; then released its head, and raising it, took a new hold with the pre-operculum higher up.

The fish is named, in the Malay language, the "Tree Climber." The fishermen keep these fishes five or six days in dry vessels, and carry them more than one hundred and fifty miles to the Calcutta market. As the *anabas* is often met with at a great distance from any water, it is frequently reputed by the natives of India to have fallen from the sky. The jugglers carry them about to amuse the people, and another of the family is reared for sport in the kingdom of Siam.

When the fish is in a state of quiet, its dull colours present nothing remarkable; but if two be brought together, or if one sees its own image in a looking-glass, the little creature becomes suddenly excited, the raised fins and the whole body shine with metallic colours of dazzling beauty, while the projected gill-membrane, waving like a black frill around the throat, adds something of grotesqueness to the general appearance. In this state it makes repeated darts at its real or reflected antagonist. But both, when taken out of each other's sight, instantly become quiet.

A gentleman at Singapore, in 1840, was presented with several by the King of Siam. They were kept in glasses of water, fed with larvæ of mosquitoes, and had thus lived for many months. The

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* Crenilabrus rupestris.

† Labyrinthibranchus.

‡ Anabas testudineus.

§ "De Piscibus in sicco Viventibus."

|| Borassus flabelliformis.

Siamese are as infatuated with the combats of these fishes as the Malays are with their cock-fights, and stake on the issue considerable sums, and sometimes their own persons and families. The license to exhibit fish-fights is farmed, and brings a considerable annual revenue to the King of Siam. The species abounds in the rivulets, at the foot of the hills of Penang. The inhabitants name it *Pla kat*, or the "Fighting Fish;" but the kind kept specially for fighting is an artificial variety, cultivated for the purpose. We here close our account of the First Order—the Thorn-spined Fishes.

AN ANABAS CLIMBING A PALM-TREE.

Another Order of fishes,* its name being derived from the words "soft" and "wing," including fishes having bony skeletons, but with soft articulated radii in the dorsal fins, must now be considered.

A genus of fishes † may here be mentioned, of which the following are the distinguishing characters: the pectoral fins nearly equal to the body in length; the head flattened above and on the sides; the lower part of the body furnished with a longitudinal series of carinated scales on each side; the dorsal fin placed above the anal; the eyes large; the jaws furnished with small, pointed teeth. The species are distinguishable from those of the preceding order.

THE FLYING FISH.

This species, when in their own element, are constantly harassed by various fishes of prey, and it is supposed that their flights are performed for the purpose of escaping from these enemies; when in the air, however, they are subject to the attacks of various species of gulls.

THE FLYING FISH.

Whether these fishes possess the power of flying, in the true sense of the term—that is, by beating the air with their members—or whether their large fins merely serve as parachutes to sustain them in the air for a short time, after a leap from the water, is not yet fully ascertained; observers having given different accounts. The latter is, perhaps, the prevailing opinion of naturalists, and is that of the more recent observers.

"I have never," says Mr. George Bennett, "been able to see any percussion of the wings during flight, and the greatest length of time that I have seen this volatile fish on the fin has been thirty seconds by the watch, and their longest flight mentioned by Captain Hall has been two hundred yards; but he thinks that subsequent observation has extended the space. The most usual height of flight, as seen above the surface of the water, is from two to three feet; but I have known them come on board at a height of fourteen feet and upwards; and they have been well ascertained to come into the channels of a line-of-battle ship, which is considered as high as twenty feet and upwards. But it must not be supposed they have the power of elevating themselves in the air after having left their native element; for, on watching them, I have often seen them fall much below the elevation at which they first rose from the water, but never, in any one instance, could I observe them rise from the height at which they first sprang; for I regard the elevation they take to depend on the power of the first spring or leap they make on leaving their native element."

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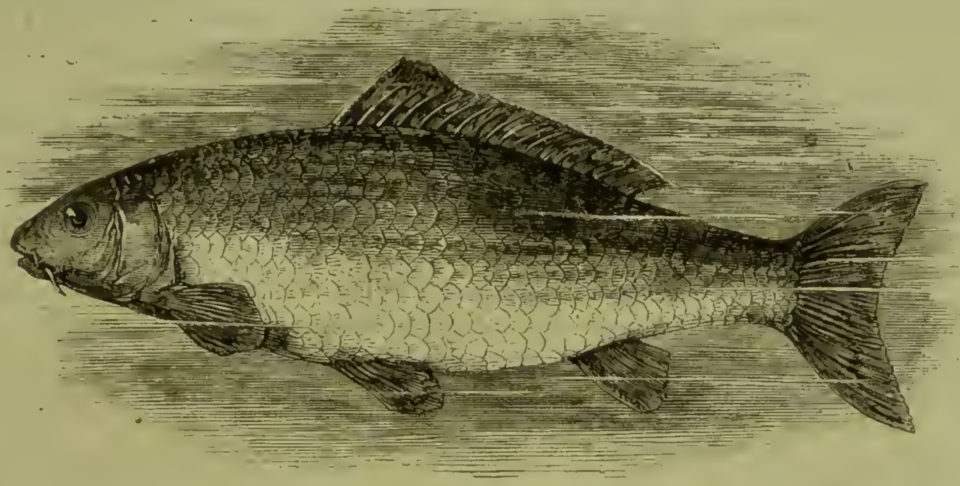
* Malacopterygii.

† Exocetus.

Judging from the foregoing quotation and similar accounts, it would appear that something beyond the mere leap of the fish would be required to account for such great heights as fourteen or twenty feet, at which these fishes have been seen. If they cannot fly, as might be supposed on examining the structure and position of their fins, it seems probable that they take advantage of the wind at times, and so adjust their fins as to be carried upwards by it.

Several instances are recorded of flying fishes appearing off the British coast; but the species is doubtful. Two species* are very abundant—the former in the Mediterranean Sea, where many fishes similar to those on our own coast occur, and the latter in the Atlantic Ocean; and it is probable that both have made their appearance in our seas.

The *Exocetus exiliens* has the ventral fins placed behind the middle of the body, and the *Exocetus volitans* has the ventrals, which are much smaller than in the former, placed anterior to the middle part of the body; these two species are, therefore, easily distinguished. The American seas afford examples of other species of this genus.



THE CARP.

In one section of this order,† the ventral fins are suspended under the abdomen, considerably beyond the pectoral fins. To this subdivision belong the family of the Carps.‡

THE CARP.§

According to Izaak Walton, this "is the queen of river fish; a stately, a good, and a very subtle fish, that was not at first bred, nor hath been long in England, but is now naturalised." Writing in the middle of the seventeenth century, he says that, about a hundred years ago, or a few more, there were, doubtless, no carp in England. The old couplet of Sir Richard Baker's "Chronicle," that

> "Hops and turkeys, carp and beer,
> Came into England all in one year,"

is erroneous, not only as regards carp, but the other items also. In the "Book of St. Albans," printed in 1496, it is said:—"The carp is a deyntous fysshe: but ther ben but fewe in Englonde." Various rewards to persons for bringing carps to the king appear in the "privy expenses" of Henry VIII. for 1532. Most probably, the carp was brought into this country some time during the fourteenth or fifteenth centuries, and no doubt for a long period continued scarce.

The usual size which the fish attains in English rivers is from twelve to fifteen or sixteen inches. Walton had never seen one exceeding twenty-three inches in length, but knew that they were found

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[*] Exocetus exiliens and Exocetus volitans. [†] Abdominales. [‡] Cyprinidæ. [§] Cyprinus carpio: Linnæus.

of a larger size. No fish can be so easily conveyed from place to place. So tenacious is it of life, that in Holland it is often kept for three weeks or a month suspended in a net with wet moss, and fed with bread steeped in milk; care being taken to refresh the fish now and then by pouring water on the moss.

The general colour of the upper parts is a rich olive-brown, which is darkest on the head; the under parts are yellowish-white, and the fins are brown; the ventral and anal fins are tinged with red.

The haunts of the carp in summer are in deep holes, under roots of trees and hollows of banks, or amidst weeds or flags. In winter they bury themselves in the mud in the quietest parts of the river. The spawning time is at the end of May or the beginning of June. In the roe of a female weighing six pounds the number of ova was 600,000; and in another, weighing ten pounds, there were 700,000. That the carp is exceedingly prolific is well known.

The carp thrives best in the central and southern parts of Europe. M. Boccius mentions two breeding carp taken from a friend's pond in Saxony, which were of the respective weights of fifty-two and fifty-three Saxon pounds, or fifty-six and fifty-seven pounds English. A stuffed carp, three feet four inches long, which was taken from Antwerp or the neighbourhood, was long to be seen at a fishmonger's in Leadenhall Market.

"You must," says Walton, "use a very large measure of patience to fish for a river carp: I have known a very good fisher angle diligently for five or six hours in a day, for three or four days together, and not have a bite." The angler can scarcely be at his pursuit too early in the morning or too late at night. "Some have been so curious as to say the 10th of April is a fatal day for carps," Walton remarks, with the simplicity which, united with a love of and a keen insight into the beauties of Nature, constitutes one of the charms of his work on angling; "it is well known, however, that from the 4th to the 14th of June is a time in which the trout-fisher is especially successful."

The franklin, in Chaucer's time, had "many a luce in stew;" and before the Reformation the manor-houses and abbeys throughout the realm had their fish-ponds, from whence they were supplied on fast-days.

Carp in fish-ponds, when constantly fed, become so tame as to take food out of the keeper's hands. At Charlottenburg, a seat of the kings of Prussia, the carp have been accustomed to feed by a bell.

The following table from a paper of Harmer's, in the "Philosophical Transactions," 1767, may serve to convey some idea of the natural increase of fishes, and the necessity of a counter-balancing havoc; showing how wisely the Almighty has adapted the laws of existence to the great end to be answered :—

Fish.	Weight of Fish Examined.		Weight of Roe.	Number of Eggs.	Date of Examination.
	ozs.	grs.	grains.		
Carp	25	5	2,571	203,109	April 4.
Codfish	......		12,540	3,686,760	December 23.
Flounder	24	4	2,200	1,357,400	March 14.
Herring	5	10	480	36,960	October 25.
Mackerel	18	0	1,223½	546,681	June 18.
Perch	8	9	765½	28,323	April 5.
Pike	56	4	5,100½	49,304	April 25.
Roach	10	6½	361	81,586	May 2.
Smelt	2	0	149½	38,278	March 21.
Sole	14	8	542½	100,362	June 13.
Tench	14	0	......	383,252	May 28.

Mr. Yarrell observes that "Bloch found 600,000 ova (eggs) in the roe of a female carp of nine pounds weight; and Schneider, 700,000 in a fish of ten pounds weight."

THE PRUSSIAN CARP.*

The Prussian Carp is another species of this genus, now naturalised in this country, and which is said to have been introduced from Germany. It is considerably less than the common carp; its usual weight is about half a pound; it has, however, been known to weigh upwards of two pounds. The Prussian may be distinguished from the common carp by the absence of barbules on the lips. The colour of the upper parts is olive brown; the belly is almost white; the cheeks and gill-covers are of a brilliant golden-yellow hue; the fins are for the most part of an orange-red colour.

THE GOLD CARP.†

This is the species kept in glass bowls in rooms, and was introduced into this country about the end of the seventeenth century from China, where they are kept in houses in a similar manner. Their radiant hues and lively, graceful movements are peculiarly pleasing to the eye. When young, they are of a dark and almost black colour, the golden red hue appearing as they become older. They abound in many of the streams in Portugal, from whence they are brought for sale to England, where they have become naturalised, and breed in ponds which are warm and sheltered, especially in those where the temperature is raised by the discharge of warm water from steam-engines.

Another genus‡ of fishes, of the family *Cyprinidæ*, and section *Abdominales*, contains numerous species, of which we shall take several specimens.

THE ROACH.§

This fish is common in most parts of Europe, swims in large shoals, and frequents rivers, lakes, &c., feeding on worms and aquatic vegetables. It usually attains from fifteen to sixteen inches in length. The scales are large. The colour of the back and upper part of the head is bluish green or dusky green, becoming lighter on the sides of the body, and shaded into silvery white on the belly. The dorsal and caudal fins are dusky, tinged with red; the anal, pectoral, and ventral fins are bright red.

THE DACE.||

The dorsal fin of this fish commences rather behind the middle of the body, whereas in the roach it is exactly half way between the nose and the base of the tail fin. The colouring of the upper part of the head and back is dusky blue, becoming paler on the sides of the body, and shaded into silvery white on the belly. The dorsal and caudal fins are pale brown; the pectoral, ventral, and anal are almost white, but tinted with pale red.

Of the Roach and the Dace Walton says, "They be much of a kind, in matter of feeding, cunning, goodness, and usually in size." The dace, however, is longer, and not so broad as the roach, and its fins and eyes are of a less brilliant colour; but they both have a handsome and silvery appearance. They are both gregarious, and the two species frequently congregate in the same river. The roach is more widely dispersed in the temperate parts of Europe than the dace; but in this country they are both very common.

Roach prefer deep and quiet rivers, and will breed well in ponds; but dace love streams deep but clear, with a gentle current, and do not thrive so well in ponds. By day, roach haunt deep water, in and near beds of weeds, or under the shade of the trees which overhang the banks. Walton calls this fish "the water-shrimp, for his simplicity or foolishness;" but several writers of eminence dispute his statement.

Roach-fishing is excellent practice for beginners; and almost as much dexterity and quickness are required as in fly-fishing. To the more experienced, even, the fish affords excellent sport: Walton added, "Especially the great roaches about London, where I think there be the best roach-anglers." Neither roach nor dace are much esteemed for the table.

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* Cyprinus gibelio. † C. auratus. ‡ Leuciscus. § Leuciscus rutilus. || Leuciscus vulgaris.

Punt-fishing for roach by the starlings of Old London Bridge was once a common amusement of the city anglers, which they continued to enjoy to the end of the reign of George I. Sir John Hawkins, in his edition of Walton's "Angler," published in 1760, gives an interesting account of their latter-day exploits. "The Thames," he says, "as well above as below bridge, was formerly much resorted to by London anglers; and which is strange to think on, considering the unpleasantness of the station where they were used to fish, near the starlings of the bridge. This will account for the many fishing-tackle shops that were formerly in Crooked Lane, which leads to the bridge.

"In the memory of a person not long since living, a waterman that plied at Essex stairs, his name John Reeves, got a comfortable living by attending anglers with his boat: his method was to watch when the shoals of roach came down from the country, and when he had found them, to go round to his customers and give them notice. Sometimes they (the fish) settled opposite the Temple; at others at Blackfriars or Queenhithe; but most frequently about the chalk-hills* near London Bridge. His hire was two shillings a tide. A certain number of persons who were accustomed thus to employ him raised a sum sufficient to buy him a waterman's coat and silver badge, the impress whereof was himself, with an angler in his boat, and he had annually a new coat to the time of his death, which might be about the year 1730." In 1760 Shepperton and Hampton were much resorted to by London anglers, for roach-fishing.

PUNT FISHING.

Turning to one of the Parliamentary Reports on the state of the water supplied to the inhabitants from the river, we learn, by the evidence of fishermen, that since 1820, flounders, eels, roach, smelts,

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[*] The depositions from the rubble composing the starlings.

salmon, and other fish had been unable to live in that part of the Thames between Woolwich and Putney. In this Report, issued in 1828, Mr. Goldham, the clerk of Billingsgate Market, states that about twenty-five years ago there were four hundred fishermen, each of whom was the owner of a boat and employed a boy; and they obtained a good livelihood by the exercise of their craft between Deptford and London, taking roach, plaice, smelts, flounders, salmon, shad, eels, gudgeon, dace, dabs, &c. Mr. Goldham states that, about 1810, he had known instances of as many as ten salmon and three thousand smelts being taken at one haul up the river towards Wandsworth, and fifty thousand smelts were brought daily to Billingsgate, and not fewer than three thousand Thames salmon in the season. Some of the boats earned six pounds a week, and salmon was sold at three shillings and four shillings the pound. The fishery was nearly destroyed at the time when this evidence was given. Punt-fishing has, however, been often practised since that date; and the scene depicted in our engraving was of no extraordinary occurrence.

THE GRAINING.*

The first accurate account of this fish was given by Mr. Yarrell. M. Agassiz, having examined the species when in England, immediately recognised it as an inhabitant of some of the lakes of Switzerland. In this country it appears to be chiefly, if not wholly, confined to the Mersey and some streams connected with that river, where it is met with in considerable abundance.

The adult Graining is from about seven to nine inches in length. The top of the head, the back, and upper part of the sides are of a pale drab colour, tinged with bluish red, separated from the lighter coloured inferior parts by a well-defined boundary line; all the fins are pale yellowish-white.

THE CHUB.†

This fish is of a moderately elongated and thick form. The scales are large. The colour of the upper parts is dusky green, the sides of the body and the belly silvery white; the lateral scales are dotted with black; the dorsal and caudal fins are dusky; the pectorals are pale; the anal and ventral fins are tinged with red, with the exception of the two or three last rays.

The Chub is common in many of the rivers of this country, often frequenting holes near the roots of trees. It is shy and recluse in its habits, and loves the shelter of willows and steep banks, which throw a shade over its lurking-place, so as to secure it from observation.

THE RUD, OR RED-EYE.‡

Somewhat similar to the roach in its form, the body of this fish is higher and thicker, and is distinctly raised at the fore part of the dorsal fin, so as to form an obtuse angle. The upper parts are of an olivaceous colour, tinged with green and blue; the sides and the belly golden orange; the dorsal and caudal fins dusky; the pectorals pale; the anal and ventrals tinged with red, excepting two or three of the last rays. This fish is common in the Thames, and in most of our rivers.

THE BLEAK.§

This fish is of a more slender and elongated form than any of those immediately preceding. The scales are of moderate size. The general colour is silvery white, which is shaded into an olivaceous green on the upper parts. All the fins are whitish.

The Bleak is a small species, and usually about six or seven inches long. It is common in many parts of Europe, as well as of this country, usually occurring in the same streams as the roach and the dace; it swims in great shoals, and spawns in May.

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* Leuciscus lancastriensis. † Leuciscus cephalus. ‡ Leuciscus erythropthalmus. § Leuciscus alburnus.

THE AZURINE.*

In some of the streams of Lancashire, this fish, called also the Blue Roach, occurs, though perhaps not abundantly. It was first described as a new species by Mr. Yarrell, in the "Linnæan Transactions," vol. xvii., part 1, p. 8, having been previously unknown either to British or Continental naturalists, though we believe that, with the graining, it inhabits some of the Swiss lakes.

It seldom weighs more than ten or twelve ounces, rarely a pound. Its general colour is glossy slate blue, passing into silvery white beneath; fins white.

THE MINNOW.†

In all our clear streams, brooks, and rivers, the Minnow, or Pink, abounds in shoals, roving about in quest of food, now appearing in the shallows, now seeking the deeper parts, and anon scattering asunder, as some pike, trout, or perch, intent on prey, strikes the phalanx with panic. "We have often watched their movements," says a naturalist, "and have frequently seen them, in compact array, encircle various objects, as a large worm or dead fish, on which they have continued to feed until disturbed on purpose; we have seen them, too, when scattered, re-assemble by degrees, and again proceed with their feast."

The colours of this little fish are exquisitely beautiful, and its movements are prompt and active. Numbers in a short space of time may be readily captured, and a good dish of fried minnows, small as the fish is, is by no means to be despised as a delicacy.

The minnow breeds in June, and the young, by the middle of autumn, is about three quarters of an inch in length. The adult fish seldom measures more three inches or three and a half.

THE LOACH.‡

This little tenant of our gravelly streams is remarkable for its slimy surface, and six barbules on its upper lip. This fish is in the habit of lurking under stones, where it lies perfectly concealed from observation. When disturbed, it darts rapidly along, keeping, however, at the bottom of the water, and speedily availing itself of another hiding-place. The flesh of the Loach, small as the fish is (seldom exceeding four inches in length) is very delicate, and on the Continent highly prized. It was on this account that Frederick I., King of Sweden, caused this species to be brought from Germany, and naturalised in his own country.

THE PIKE.§

This fish, now very common in most of our rivers and lakes, may be taken as a specimen of another family.‖ It is not supposed to be indigenous to this country, and was considered a great rarity for many years after its introduction. The form of the body is elongated, and the dorsal fin is placed far back.

The Pike has various names in our language, as pickerel, luce or lucie, and, in Scotland, gedd. Pike of small size are often called jack.

The habit of the pike is to remain under the shelter of water-plants, until his attention is attracted by some passing victim, when, like the tiger springing from the jungle, he rushes forth, seldom, indeed, missing his aim. The jaws and palate of the pike are most formidably armed with sharp teeth, of various sizes.

Of the daring and ferocity of this fish many authenticated instances are on record. Walton says: "Gesner relates, that a man going to a pond (where it seems a pike had devoured all the fish) to water his mule, had a pike bite his mule by the lips, to which the pike hung so fast that the mule drew him out of the water, and by that accident the mule angled out the pike. And the same Gesner observes, that a maid in Poland had a pike bite her by the foot, as she was washing clothes in a pond. And I

* Leuciscus cœruleus.

† Leuciscus phoxinus.

‡ Cobitis barbatula.

§ Esox lucius.

‖ Esocidæ.

have heard of the like of a woman, in Killingworth pond, not far from Coventry. But I have been assured by my friend, Mr. Seagrave, who keeps tame otters, that he hath known a pike, in extreme hunger, fight with one of his otters for a carp that the otter had caught, and was then bringing out of the water." Dr. Plot states, that at Trentham, Staffordshire, a pike seized the head of a swan, as she was feeding under water, and gorged so much of it that both fish and swan perished; the keepers perceiving the swan fixed with its head under water for an unusual time, took a boat to go to the bird's assistance, but it was too late. Mr. Yarrell, on Mr. Jesse's authority, says, "The present head keeper of Richmond Park was once washing his hand over the side of a boat, in the great pond in that park, when a pike made a dart at it, and he had but just time to withdraw it." Mr. Jesse adds, that "a gentleman now residing in Weybridge, in Surrey, walking one day by the side of the river Wey, near that town, saw a large pike in a shallow creek. He immediately pulled off his coat, tucked up his shirt sleeves, and went into the water to interrupt the return of the fish into the river, and to endeavour to throw it out on the bank by getting his hands under it. During the attempt, the pike, finding he could not make his escape, seized one of the arms of the gentleman, and lacerated it so much that the marks of the wound are still visible." The following anecdote is taken from one of the public papers, August 25, 1846:—"On Thursday, Mr. Collet, in company with a friend from London, was fishing at Shepperton, for barbel, when the bait was taken by a roach, which, in its turn, was instantly seized by a pike. The line was drawn in, the pike continuing its hold upon the small fish till near the water's edge, when it suddenly leaped from its victim, and threw itself on the bank, when both pike and roach were captured. The pike weighed nine pounds; and, on opening it, in its stomach were found three small fish, a water-rat, and a young moor-hen."

THE PIKE.

The voracity of the pike is connected with its rapidity of growth, which necessitates an abundant supply of nutriment, and involves at the same time extreme celerity of digestion. A young pike is recorded to reach the length of about eight inches during the first year, to that of twelve or fourteen during the second year, and of eighteen or twenty inches during the third; after this, its increase for several successive years, where stores of food are abundant, is at the rate of three or four pounds per year. Eight pike, of about five pounds each, have been ascertained to devour eight hundred gudgeons in three weeks. Some idea from this may be formed of the havoc this fish must make in the meres, lakes, or rivers, in which it is plentiful, and of the necessity of encouraging the breeds of inferior fishes, as the bream and others, for its due maintenance. The pike not only lives to an extreme age, but attains to extraordinary dimensions. Pennant speaks of one ninety years of age; and Gesner notices a pike taken at Hailbrun, in Suabia, in 1497, with a brazen ring attached to it, on which was inscribed in Greek characters, "I am the fish which was first of all put into the lake by the hands of the governor of the universe, Frederick the Second, the 5th of October, 1230." This fish must, therefore, have been at least two hundred and sixty seven years old. It is said to have weighed three hundred and fifty pounds.

In the lakes of Scotland and Ireland, pike weighing from fifty to seventy pounds have occasionally been taken; and Horsea Mere and Heigham Sounds, two large sheets of water in Norfolk, have been long celebrated for the size and excellence of their pike, and also for their abundance.

In the lakes of North America, a species of pike, called the muskanungee, grows to an enormous size, but we cannot obtain any definite measurements.

It must not be supposed that the larger pike are, the better is their flesh for the table. Walton rightly says, "Old or very great pikes have in them more of state than goodness; the smaller or middling-sized pikes being, by the most and choicest palates, observed to be the best meat."

In warm and sunny weather, the pike mostly swims near the surface, and may be often seen luxuriating in the sunbeams, lulled into a sort of slumber. It is not difficult at such times to draw a wire noose, fastened to the end of a rod or long staff, over its head and body, and land it by a sudden jerk.

THE GARFISH.*

This sea-fish is remarkable for its elongated slender body, and long projecting jaws, tapering to an attenuated point, and armed with small teeth. The bones of this fish are green.

The Garfish is very active and vigorous, and cuts through the water, generally near the surface, with great rapidity. In April, or May, it leaves the deep sea, and visits various portions of our coast and that of Continental Europe, for the purpose of breeding.

This fish is often called "the mackerel guide," from its appearing a little before the shoals of mackerel; it is taken in considerable numbers, and, during its short stay, may be seen abundantly in the London markets; its flesh, however, is but indifferent.

THE SKIPPER.†

Occasionally an allied species, the Skipper, or Saury Pike, visit our shores in shoals, generally making their appearance in June. It is common in the Mediterranean, and is there a favourite prey of the tunny, which scatters the shoal as it darts amidst them, throwing them into consternation. In order to escape their foe, they leap one over the other, to a great distance out of the water, the hindmost striving to get first in the race, and the foremost rushing for yards together on the surface of the water, which they scarcely seem to touch. Often does the mariner gaze on such a scene. Thousands of skippers pass the vessel, with tunnies and bonitoes in full chase, their scales glistening in the sun; anon the pursued and their pursuers disappear in the deep, and anon they return to the surface, all in confusion, but still rushing along, leaping and diving, till out of the spectator's sight.

In form the skipper much resembles the garfish; but the posterior half of its long body is stouter and deeper in proportion. Its gill-covers are silvery white, as are the sides and under parts; but the back and top of the head are of a dark blue.

THE BARBEL.‡

The Common Barbel sometimes measures three feet in length, and weighs from fifteen to eighteen pounds. Its scales are small, its head is smooth, its eyes are large and contiguous to the nostrils, and the lateral line is straight, and nearly parallel to the back. Its pectoral fins are of a pale brown colour; the others are tipped with yellow; the tail is of a deep purple; and the general colour of the scales is pale gold, edged with black on the back and sides, and silvery white on the belly. The dorsal fin is armed with a strong, toothed spine, with which it sometimes inflicts dangerous wounds on the hands of the fishermen.

The barbel is gregarious in its habits, and is swift and vigorous. During the summer these fish frequent the shallow parts of the river, and the female, in May or June, deposits her eggs in the gravel. Though very shy, they are said to be extremely sportive, darting with the utmost ease up the most rapid current. Worms, the larvæ of insects, and small fishes, are their ordinary food: and they love to lurk among weeds, digging in the mud with their noses, probably in quest of prey. On the approach of winter they seek the deeper parts of the river, and shelter themselves in holes under the bank, or the wood-work of locks, dams, or weirs, and similar situations. In severely cold weather they sink into a state of partial torpidity, and may be captured by means of a landing-net, without attempting to escape.

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* Belone vulgaris.

† Scomberesox saurus.

‡ Barbus vulgaris.

The colour of the barbel above is olive-brown, passing into yellowish-green on the sides; the gill-covers are tinged with bronze; the fins of the lower parts are flesh-colour.

THE GUDGEON.[*]

AMONG the smaller fishes of our sandy or gravelly streams and rivers, we may notice this pretty little fish, which, were its size equal to the delicacy of its flesh, would be in considerable request. As it is, numbers are taken in nets by the Thames fishermen, and kept alive in well-boats for sale. They may also be frequently seen alive in stone or leaden tanks in the shops of the fishmongers.

The Gudgeon is gregarious, wandering about in shoals, and feeding upon worms, the larvæ of insects, and the eggs of fishes. Few fish bite more freely; two or three dozen, indeed, may be often taken in the course of an hour. This fish seldom exceeds five or six inches in length. As it is well known, no detailed description is necessary. It breeds in May, depositing its eggs among loose stones and gravel.

THE TENCH.[†]

THE deep pits, ponds, and lakes, and still, sluggish rivers of England (and also of some few parts of Scotland and Ireland) present us with the Tench, a deep-bodied, slimy fish, with minute scales, and decidedly superior for the table to the carp. This fish appears, like the carp, to have been at some period introduced and naturalised in our island, but we have no data respecting it. The most congenial abodes of this fish are deep drainage ponds of soft water, with a muddy bottom, having a luxuriant border of aquatic plants, with abundance of pond-weed throughout. In such pits or ponds it thrives and multiplies greatly, often attaining to a considerable size, and the weight of two or three pounds. Occasionally it is said to taste rankly of some kind of weed or mud; but specimens of this fish, from some of the muddiest ponds in Essex, are sometimes of very superior flavour, and finely grown. Their colour is very dark, with a pink tinge about and under the pectoral fins.[‡]

The tench breeds in June and July. Of its fecundity we may form some estimate, when we learn from Bloch, that in a fish of four pounds weight he found nearly 300,000 eggs composing the roe. Nothing is more easy than to stock appropriate ponds with this excellent fish, to which the carp is most decidedly inferior. The male fish is at once distinguishable from the female by the large size of the ventral fins; the proportion of the males should be double to that of the females, and well-grown specimens should be selected. The food of the tench consists of worms, larvæ, and various vegetable matters. During the winter these fishes retire to holes and snug recesses, and stir but little; indeed, they are not among the most active of their tribe at any time. Sometimes they get blocked up in their retreats, but this is of little consequence, for such is their vitality, that as long as they are bedewed with water and their gills kept wet, they will live and feed on what chance throws in their way. Daniel, in his "Rural Sports," gives a curious confirmation of these facts, which is quoted by Mr. Yarrell, and may well be repeated here, as it is on undoubted authority:—"A piece of water, which had been ordered to be filled up, and into which wood and rubbish had been thrown for years, was directed to be cleaned out. Persons were accordingly employed; and, almost choked up by weeds and mud, so little water remained, that no person expected to see any fish, except a few eels; yet nearly two hundred brace of tench of all sizes, and as many perch, were found. After the pond was thought to be quite free, under some roots there seemed to be an animal, which was conjectured to be an otter. The place was surrounded, and on opening an entrance among the roots, a tench was found of most singular form, having literally assumed the shape of the hole in which of course he had been for many years confined. His length from eye to fork was thirty-three inches, his circumference almost to the tail was twenty-seven inches, his weight eleven pounds nine ounces and a quarter; the colour was also singular, his belly being that of a char, or vermilion. This extraordinary fish, after having been inspected by many gentlemen, was carefully put into a pond, and, at the time the account was written, twelve months afterwards, was alive and well." Not only, then, did this fish live in his moist prison, but grew to an enormous size. The tench is too well known to require a particular description.

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[*] Gobio fluviatiles.

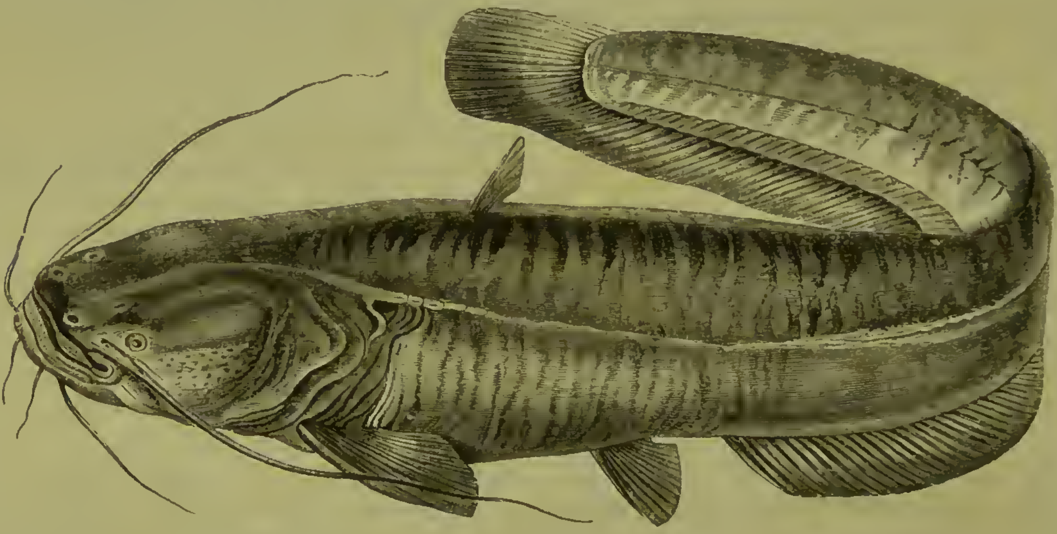
[†] Tenca vulgaris.

[‡] It is remarkable that Mr. Yarrell quotes a similar statement by Daniel, respecting tench taken at Munden Hall Fleet, in Essex.

THE BREAM.*

In many of our large rivers or lakes, and in some of our canals and slow rivers, a fish called the Bream, or Carp-Bream, is very abundant; it inhabits the lakes of Cumberland and those of Ireland, and is common in the southern and central parts of the European continent.

Walton says: "The French esteem this fish highly, and to that end have this proverb, 'He that hath breams in his pond, is able to bid his friend welcome.' And it is noted that the best part of a bream is his belly and head." This last observation may be taken as a tacit admission that the bream does not merit the praise bestowed upon it; in fact, its flesh is insipid, and full of little bones; but French cookery may probably render it palatable.



THE SLY SILURUS.

The bream is very prolific, and in large lakes affords an abundant supply of food to pikes, and other voracious fishes. The female deposits her eggs in May, and, according to Bloch, there are 130,000 in the roe of a well-grown individual. In some parts of Ireland, where breams are very abundant and very large, sometimes weighing ten or twelve pounds each, the fish are taken in large quantities and dried, in which state they are acceptable to the peasantry. The bream has neither bony rays on any of its fins, nor barbules about the mouth; its body is deep and compressed; its general colour is yellowish-white, often with a tinge of brown. A distinct and smaller species, of a silvery-white, inhabits some of our rivers, as the Trent, the Cam, as well as lakes, &c. It is the White Bream, or Bream-Flat,† common on the Continent. It is in no request for the table.

THE SLY SILURUS.‡

The Sheat Fish, as it is sometimes called, a member of another family,§ is found not only in almost all the fresh waters of Europe, but even in those of Africa and Asia. Pliny described it as existing in the Nile. Bloch mentions that examples weighing from seventy to eighty pounds have been taken in canals near Berlin.

The two very elongated barbules of the upper lip are supported by extensions of the intermaxillary bones, which increase the sphere of action and consequent utility of these organs of touch, by extending their influence beyond the range of the shorter cirrhi of the lower lip.

Thus it is shown to be a ground-feeder; and Bloch states that it seldom leaves its hole except during storms.

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* Abramis brama.

† Abramis blicca.

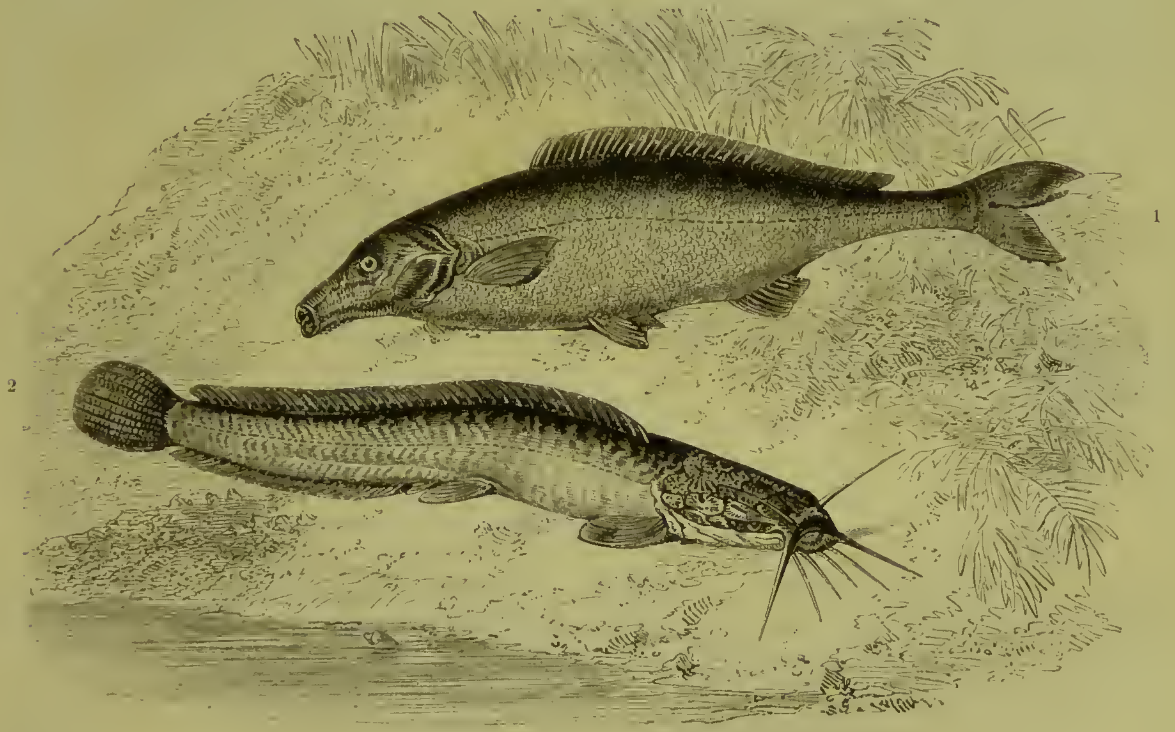
‡ Silurus glanis.

§ Siluridæ.

Another family* have the head furnished with a rough, flat buckler, and broader than in any other Silurus, because the frontals and parietals give out lateral plates, which cover the orbit and the temple; the operculum is still smaller in proportion than in the preceding genera.† But what distinguishes these from all other fishes is the peculiarity observed by M. Geoffroy, that independently of the ordinary branchiæ, they have apparatus ramified like trees, adhering to the superior branch of the third and fourth branchial arch, and which appear to be a sort of supernumerary gills. Their branchial membrane has from eight or nine to thirteen or fourteen rays; their pectoral spine is strong and dentated, but nothing of this is to be found in the dorsal; their body is naked and elongated, as are also the dorsal and anal; there is no spine to the dorsal; the caudal is distinct. Those which are known have eight barbels; they come from the Nile, the Senegal, and from some rivers of Asia. Their flesh is not good.

THE SHARMUTH, OR BLACK FISH.‡

Some of the preceding family have but a single dorsal, altogether radiated. The species now mentioned is one of these; it is common in Egypt and Syria, and constitutes in this last country a principal article of food.



1. MORMYRUS OXYRHINCUS. 2. THE SHARMUTH, OR BLACK FISH.

Another black fish§ of a different section,|| genus,¶ and family,** has been met with, though very rarely, on the British coast. It is of a black colour—the fins intensely so; the under parts are of a slightly paler hue. The head is rather blunt, and rounded in front; and the mouth is small. There is a thin elevated ridge on the back, to which the dorsal fin is attached.

Mr. Yarrell describes one specimen as fifteen inches long, and another measured two feet eight inches in length. The skin was so tough, that it was stripped off from the fish like that of an eel. The taste was delicious. These fish were both caught off the coast of Cornwall, and the species is said to have great strength and velocity. A third black fish is found in the Orontes, in shape resembling the sheat fish, and about twenty inches long; and one more may be mentioned as caught on the rocky shores of New England.

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* Heterobranchus. † Mormyri. ‡ Heterobranchus anguillarius. Silurus angullaris. Malacop: Abdominales. § Centrolophus morio. || Acanthopterygii. ¶ Centrolophus. ** Scomberidæ.

Another family* consists of fishes with compressed, oblong, scaly body; tail, slender at the base and enlarged towards the fin; and the head is covered with a naked and thick skin. These are ranked among the best fishes of the Nile. They vary in structure, but among them M. Geoffroy thinks will be found the one of which we give an engraving, which was so much revered by the ancient Egyptians.

The salmon tribe † belong to the present order.‡ These fishes have the body covered with scales; the first dorsal fin has soft rays only, and the second dorsal is small, destitute of rays, and of a soft, fleshy nature; they are furnished with an air bladder, and have numerous cœca.

THE SALMON.§

"THE Salmon," says Izaak Walton, "is the king of fresh-water fish," and, he adds quaintly, "he has, like some persons of honour and riches, which have both their winter and summer residences, the fresh rivers for summer, and the salt water for winter to spend his life in."

This fish is a periodical visitor to our rivers, in which it breeds, depositing its eggs in the gravel in the winter, having pushed up from the estuary during the autumn, to which it again descends in the spring, and passes the latter part of the summer in the sea. It appears, however, that the breeding season of this fish, and consequently, the precise time of its visit to the upper portions of the rivers, are influenced by various causes, which hasten or retard the development of the roe. In Sweden, according to Artedi, the salmon do not deposit their eggs till the middle of summer. The warmth of the water may be an influencing cause. "There are two rivers," says Sir William Jardine, "in Sutherlandshire, which show this late and early running (of the salmon) under peculiar circumstances. One, the Oikel, borders the county, and springs from a small Alpine lake, perhaps about half a mile in breadth; the other, the Shin, is a tributary to the Oikel, joins it about five miles from the mouth, but takes its rise from Loch Shin, a large and deep extent of water, and connected to a chain of other deep locks. Early in the spring, all the salmon entering the common mouth diverge at the junction, turn up the Shin, and return, as it were, to their own and warmer stream, while a very few keep the main course of the Oikel until a much later period."

THE SALMON.

The vigour displayed by the salmon in shooting up the most impetuous rapids is very wonderful, nor do waterfalls or cascades daunt them. Curving the body till the tail and head meet, they give a lash with all their force to the water, and spring up with amazing address. Often they miss their leap, and fall back into the river, but it is only to wait for fresh strength, and more energetically to renew their attempt; thus they surmount a fall of eight or ten feet, but not always without accidents; sometimes they throw themselves out of the stream upon the rocks and stones, and so perish; and sometimes they kill themselves, by the repetition of their fruitless efforts.

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* Mormyrus.

† Salmonidæ.

‡ Malacopterigii abdominales.

§ Salmo salar.

Having at length arrived at their proper breeding places, shallow gravelly pools in the pure stream, the salmon prepare for the deposition of the eggs. At this time the cheeks of the male become variegated with stripes of orange colour, and an orange tinge pervades the body; the lower jaw becomes elongated at its tip, by the development of a cartilaginous projection, which, when the mouth is closed, occupies a deep notch at the end of the snout. The female at the same time assumes a dark colour, and both are respectively called red and black fish. Each pair now begins to make a furrow in the gravel, working with their snouts against the stream; when this is finished, the female deposits a number of her eggs in it, and covers them up. The pair then proceed to work out other furrows, and in about ten or twelve days the whole of the eggs are deposited. Supposing the eggs to be deposited early in November, they are hatched in March, or early in April, and the young fry exhibit a rapid growth. After spawning, the salmon begin their descent to the estuary, and so enter the sea, to commence their re-ascent in autumn.

These migrations up the rivers take place earlier or later, in autumn or spring, according to the peculiarities of the river or the condition of the fish; and soon after breeding, the salmon again gradually descend to the sea; consequently, the spawning time varies, being earlier or later, according to circumstances. Rivers issuing from large lakes afford early salmon, the waters having been purified by deposition in the lakes, while, on the other hand, rivers swollen by melting snows in the spring months are later in the season of producing fish, and yield their supply when the lake rivers are beginning to fail. The more northern rivers, as a general rule, produce the earliest supply. In these the fish commence their ascent in autumn, remain there during the winter, breed in November, and return to the sea at the commencement of spring, where they reside during summer. In the Scotch rivers, the close time extends from the 14th of September to the 1st of February, when, by act of parliament, every person catching or attempting to catch fish at that period is liable to a penalty of not less than £1, nor more than £10, for every offence, besides the loss of boats and implements employed.

For a short time, both before and after spawning, the male fish is orange or red, and the flesh of both male and female becomes hard and unpalatable; the male is then called a "red fish," and the female a "black fish," from its dark hue. After spawning, they continue for some time lean and out of condition, and are then termed "kipper" or "kelt-fish," or the male is called "a kipper," and the female a "baggit." The young fry, called "smolts," descend in March and April to the estuary, and so gradually to the sea, where their growth is amazingly rapid; for fry of seven or eight inches in length, marked in April or early in May, have returned by the end of June or in July, from the sea to the river, weighing from two to three pounds and upwards, and already in a condition to breed. At this period they are termed "griles," or "grilses," and it is remarkable that they push up the river from the estuary and tideway earlier than the more adult fish.

The flesh of the salmon is well known to be of a delicate red colour. Sir H. Davy ascertained that this is owing to a peculiar coloured oil, which may be extracted by alcohol. The depth of the red colour and the quantity of curd are generally proportional. The salmon, while in their weak state, descend from pool to pool after spawning, and are at length carried to sea by the winter or early spring floods, before reaching which, however, they remain some time in the brackish water.

In the salmon rivers of Scotland a small fish, having transverse dark marks across the back to the lateral line, is known under the name of the Parr. By many observers it has been, and still is asserted, that the parr is only the young or smolt of the salmon at a certain stage of growth; some, on the other hand, regard it as a variety of the young of tho common trout. It is the *Salmo salmulus* of Willughby, and we believe, with Mr. Yarrell and Sir W. Jardine, that it is a distinct species from either, one of the smallest of the family; and it is remarkable that, in those unprotected rivers from which poaching has driven the salmon, it abounds in profusion, as well as in some streams which the salmon never visit; while in others, frequented both by the salmon and the sea-trout, it is not to be found. Nor is it the young of the common trout, from which it differs in various anatomical peculiarities. The young of the salmon, the bull-trout, the common trout and others, have dark transverse marks, which become lost sooner or later, depending on the ultimate size of the species. "Thus," says Mr. Yarrell, "they are soonest lost on the salmon and on the bull-trout, and are borne the longest on the common trout and parr; indeed, I have never seen the parr at any age or size without some trace of the remains of these markings. It is this similarity in marking and appearance of the fry which has caused the difficulty in distinguishing between the various species when so young; and experimenters, believing they had marked young parr only, have been surprised to find some of their marked fish return as grilse, young bull-trout, or whitling, salmon-trout, river-trout, and true parr." Mr. Yarrell alludes to the young of other animals being marked, and ultimately losing markings, which are permanent in other species of the family; thus, the young lion and the puma are marked like the young of the tiger, and the young of all deer are spotted, though the greater number of the species, when adult, are plain. Formerly, when the water of the Thames was purer, the parr or samlet was common between Staines and Chertsey, and was known by the name of the skeyger. It is now rarely to be found, and a Thames salmon is out of the question.

On July 26th, 1858, owing to the "spate" which came down on the previous morning, the net-fishermen on the Tweed had the largest take of salmon ever remembered by the oldest of them to have been caught in the same space of time in that river. From six o'clock in the morning, when the fishing commenced, till night, about three thousand five hundred adult salmon, and about half the number of grilses, upwards of five thousand in all, with a fair proportion of trouts, were taken. At several fisheries in the middle district more salmon were caught than are usually taken during an entire season. Wilford and Bendibus, stations about five miles up the river, had six hundred fish each: large numbers got beyond the netting district.

In the autumn of 1860 two salmon were taken in the Thames, at Erith. These fish had evidently entered the river, with others, doubtless, which escaped capture, with the view of pushing up to the spawning grounds. Salmon, in the latter end of October, are heavy in spawn, and, even in a well-stocked river, should not be taken. In the river they might be most valuable, and aid in forming a small nucleus for breeding purposes.

The streams which flow from Nant Gwynant and Nant Colwyn, in North Wales, unite together a little below the bridge of Beddgelert, and thenceforward they take the name of the Glasslyn, which rushes down through the celebrated Pass, amidst a thousand obstructing rocks and shivered crags, shouting manfully as it fights among them its foamy path. For a mile and more, furious little cascades and swiftest rapids, only broken at intervals by an eddying pool, where the foam-flecked water whirls round playfully for an instant and then dashes once more over the rocks, form the course of the river.

Here the visitor may often see an angler, who delights in these rapids, cascades, and little eddies, because they are the haunts of the trout and the salmon. If, too, he should see a stalwart fresh-water fisherman hook a fine fish, he may wonder how it is to be got out from among the stones and sharp rocks where it keeps leaping and floundering. But as he looks on, he will observe that patience is an attribute of the "gentle craft;" that the salmon is allowed to exhaust its fresh vigour in fierce but useless attempts to escape, and then, before it can recover its scattered energies, it is suddenly speared with a barbed weapon, and lifted out all but lifeless on to the grass. Salmon are also taken by the coble-net, the stake-net, and the halve-net, as well as by spears.

The increasing scarcity and consequent high price of salmon has directed public attention during the last few years to the artificial propagation of fish, which has been practised with considerable success on the Continent, as well as in our own country. This art dates from the time of the Romans, among whom, however, it appears to have consisted rather in conveying the spawn of fish from the spawning-bed to an exhausted lake, and thus replenishing the waters, than actually ejecting the ova and impregnating them with milt by an artificial process. The fish-egg hatching processes, lately introduced, are various; and we are not prepared to pronounce upon their respective merits. It is satisfactory, however, to know that the importance of the subject is now generally recognised; and that the production of cheap food by the propagation of different kinds of fish is likely to become a valuable branch of industry.

THE TROUT.

UNDER this name may be ranged various members of the Salmon family, clearly distinguishable from the noble fish that stands at their head. The Salmon Trout,* next in value to the Salmon itself, is found in many of the rivers in England; it is plentiful in the Esk and the Eden, which communicate with the Solway, where it is called Sea Trout; and it is most abundant in the rivers of Scotland. The Common Trout* inhabits most of the rivers and lakes of Great Britain, but so considerably does it vary in appearance in different localities, as to lead to the supposition that several species exist. The Gray Trout,† often called the Bull Trout or Roundtail, is distinguished from these by several specific peculiarities.

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* Salmo trutta.

The Trout is common in all the rivers and lakes of Great Britain. "It is," says Izaak Walton, "a fish highly valued both in this and foreign nations. He may be justly said, as the old poet said of wine, and we English say of venison, to be a generous fish—a fish that is so like the buck, that he also has his seasons; for it is observed that he comes in and goes out of season with the stag and buck. Gesner says his name is of a German offspring, and he is a fish that feeds cleanly and purely, in the swiftest streams, and on the hardest gravel; and that he may justly contend with all fresh-water fish, as the mullet may with all the sea-fish, for precedency and daintiness of taste, and that being in right season, the most dainty palates have allowed precedency to him." The trout usually feeds on small fish, frogs, and insects. The spawning season with the trout is generally October or November, but sometimes a little sooner or later. In this it differs from most other fish, who usually spawn in the spring months, and some in the summer.

As to the full grown, the difference, particularly in point of size, is often very remarkable: the smaller the stream, the smaller the trout found therein, may be taken as a general rule. But this rule does not apply to any but small streams; for a brook of considerable size, or very moderate sized rivers, will often yield trout equal both in size and quality to those found in our largest rivers. Something depends upon the supply of food; but it is well known that trout kept in small ponds or streams, where they have received a regular daily supply of food besides what the water afforded them, have never attained a large size, a size even approaching those that were permitted to occupy large ponds or lakes in the same neighbourhood, where both the water and the food were precisely of the same quality and character. With regard to small streams where the fish are not protected, it might be asserted with some show of reason that but few trout in such situations escape the angler or the net-fisher for any considerable number of years. This may be true as regards the generality of such streams, but in certain situations even small brooks possess their deep pools and secure holds, under banks or rocks, where none save the angler can possibly take them. Now, even in situations like these, although fish of moderate size, and which have been known to occupy their haunts for several years, are sometimes met with, the largest of them would be considered of very inferior size, if caught in larger streams or rivers. Moreover, when the small brook-trout breed, their progeny—at one, two, and three years old—are all diminutive, and, in point of size, in precise keeping with the parent fish. Nothing can demonstrate this more clearly than what is observable in the wilds of an uninhabited country. Take the forests of America, for example, and there we find that trout inhabiting the streams which have never been disturbed by the presence of man, and may be said to be in a state of Nature, are small in the small streams, while in the large streams and rivers they attain a size three or fourfold the magnitude. Among the gray or lake trout, found also in America, the largest lakes furnish specimens of the largest size. Thus in those inland seas connected with the western parts of Canada and the United States, a species of trout, known there as the salmon trout,

THE SALMON TROUT.

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* Salmo fario.

† Salmo eriox.

often grows to a weight of forty pounds or more; while in the second and third-rate lakes the same sort of fish very rarely attains to the weight of ten pounds, and in the very small lakes it is an extraordinary occurrence to meet with a salmon trout weighing over four pounds. This is a very singular fact, since in many of the smaller lakes there is a depth of one or two hundred feet of water, and a most abundant supply of sundry sorts of small fish, as well as of other bait, on which trout delight to feed.

In Mr. Stoddart's "Art of Angling as practised in Scotland," an experiment is mentioned as being made with some trout, a few years back, for the purpose of ascertaining the effect produced upon them by different food. "Fish were placed in three separate tanks, one of which was supplied daily with worms, another with live minnows, and the third with those small, dark-coloured water flies which are to be found moving about on the surface under banks and sheltered places. The trout fed with worms grew slowly, and had a lean appearance; those nourished on minnows, which, it was observed, they darted at with great voracity, became much larger; while such as were fattened upon flies only attained in a short time prodigious dimensions, weighing twice as much as both the others together, although the quantity of food swallowed by them was in no wise so great."

The trout is in perfection in May, June, and July, and its colours are very beautiful during these months, the numerous reddish-brown spots and bright red spots on its back and the upper part of its sides being clear and distinct; the lower parts of the sides being golden-yellow, and the under parts silvery-white. There is, however, great variety in the colour of the trouts of different rivers, some being darker, some lighter in their tints; and in the black rivers running over beds of shale, in the moorlands, as the upper part of the Wye, near Buxton, in Derbyshire, the small trout have been seen of an almost inky hue; while on the same river, along the Bakewell road, on its way to join the Derwent, where the water is beautifully clear, the trout are of a pale golden colour and beautifully spotted. They are, however, seldom of very large size.

The trout would appear to be a long-lived fish. At Dumbarton Castle a trout died, in 1809, which had been kept, as asserted, in the well for twenty-eight years; and the *Westmoreland Advertiser*, in August, 1826, contained, as Mr. Yarrell states, a paragraph respecting a trout which had lived for fifty-three years in a well in the orchard of Mr. W. Mossop, of Board-hall, near Broughton-in-Furness. The flesh of the trout is very delicious, and when in full season, of a pure salmon-pink colour.

Mr. Yarrell mentions a trout caught at Salisbury, in a little stream branching from the Avon, whose weight, on being taken from the water, was found to be twenty-five pounds. Mrs. Powell, at the bottom of whose garden the fish was first discovered, placed it in a pond, where it was fed and lived four months, but had decreased in weight at the time of its death to twenty-one pounds and a quarter.

Trout of twelve and fifteen pounds weight have been caught in the Thames, near Kingston and Chertsey, some measuring twenty-eight inches and upwards in length. Izaak Walton says: "It is well known that in the Lake Leman (the Lake of Geneva) there are trouts taken of three cubits long, as is affirmed by Gesner, a writer of good credit; and Mercator says the trouts that are taken in the Lake of Geneva are a great part of the merchandise of that famous city. And you are further to know, that there be certain waters that breed trouts remarkable both for their number and smallness. I know a little brook in Kent that breeds them to a number incredible, and you may take them twenty or forty in an hour, but none greater than about the size of a gudgeon."

Much is, undoubtedly, dependent on the situations in which the fish are found. There are, however, numerous proofs on record that the trout found in our own small mountain-streams may be made to increase remarkably in size under a change of circumstances.

Sir Humphry Davy thus gives a summary of the various attractions of angling, and the reasons why it has not unfrequently been pursued with ardour by poets and philosophers:—"The search after food is an instinct belonging to our nature; and from the savage, in his rudest and most primitive state, who destroys a piece of game, or a fish, with a club or spear, to man in the most cultivated state of society, who employs artifice, machinery, and the resources of various other animals, to secure his object, the origin of the pleasure is similar, and its object the same: but that kind of it requiring most art may be said to characterise man in his highest or intellectual state; and the fisher for salmon and trout with the fly employs not only machinery to assist his physical powers, but applies sagacity to conquer difficulties; and the pleasure derived from ingenious resources and devices, as well as from active pursuit, belongs to this amusement. Then as to its philosophical tendency, it is a pursuit of moral discipline, requiring patience, forbearance, and command of temper. As connected with natural science, it may be vaunted as demanding a knowledge of the habits of a considerable tribe of created beings—fishes, and the animals that they prey upon, and an acquaintance with the signs and tokens of the weather and its changes, the nature of waters, and of the atmosphere. As to its poetical relations, it carries us into the most wild and beautiful scenery of Nature; amongst the mountain lakes, and the clear and lovely streams that gush from the higher ranges of elevated hills, or that make their way through the cavities of calcareous strata. How delightful in the early spring, after the dull and tedious time of winter, when the frosts disappear and the sunshine warms the earth and waters, to wander forth by some clear stream, to see the leaf bursting from the purple bud, to scent the odours of the bank perfumed by the violet, and enamelled, as it were, with the primrose and the daisy; to wander upon the fresh turf below the shade of trees, whose bright blossoms are filled with the music of the bee; and on the surface of the waters to view the gaudy flies sparkling like animated gems in the sunbeams, whilst the bright and beautiful trout is watching them from below: to hear the twittering of the water-birds, who, alarmed at your approach, rapidly hide themselves beneath the flowers and leaves of the water-lily; and as the season advances, to find all these objects changed for others of the same kind, but better and brighter, till the swallow and the trout contend, as it were, for the gaudy May-fly, and till, in pursuing your amusement in the calm and balmy evening, you are serenaded by the songs of the cheerful thrush and melodious nightingale, performing the offices of paternal love, in thickets ornamented with the rose and woodbine!"

The only sportsman-like way of taking trout is by "whipping," as it is sometimes called, or angling with an artificial fly. The rod should be, according to the width of the stream, from twelve to twenty feet long. The most expert anglers use one fly only at a time, called a stretcher; while others, unskilful or impatient, use one or two additional flies, called droppers or bob-flies, which are very attractive to trout, playing on the surface of the water, and other fish. But while trout rise at them freely, they are seldom hooked by these flies, and even when they are, it is found difficult to land the trout, because the other hooks are apt to entangle them.

The best anglers always cast up stream, and use a *dry* fly, throwing it backwards and forwards several times over their heads to dry it before making a fresh cast, and seldom making a throw unless they see a fish rise. This is a gentleman's mode of fishing, when, notwithstanding the strictness with which streams are preserved all over England, he can obtain permission to have a day's sport, which is commonly granted unless streams are let.

A large trout may always be known when feeding in the evening. He rises continuously, or at short intervals, in a still water, almost always in the same place, and makes little noise, barely elevating his mouth to suck in the fly, and sometimes showing his back-fin and tail. A large circle spreads around him; but there are seldom any bubbles when he breaks the water, which usually indicate the coarser fish.

THE CHAR.*

THE lakes of Cumberland, Westmoreland, and Lancashire, some of the Scotch and Irish lakes, and the lake of Geneva, afford a delicately flavoured fish, known as the Char, Charr, or Alpine Chair, the potted flesh of which, though often mixed with that of trout, is sent to London.

The char averages from nine to fourteen inches in length; it is very shy, and does not rise well at the fly, but is, nevertheless, sometimes taken by the trout-fisher; it will bite at the minnow more readily, and is often taken in deep water by drawing the bait sunk by means of a lead, two or three feet above the minnow, after a boat. The lake is to the char what the sea is to the salmon; on the approach of the breeding season, they ascend the rivers or feeders of the lake, selecting those in preference which have a hard, stony, or rocky bed. Hence the char of Windermere, contrary to the trout, choose the Brathy in preference to the sandy-bedded Rothay; and in November and December the shoals make their ascent. The flesh of the char when in season (namely, June and July) is beautifully flaky, and of a fine orange tint. From unknown causes, char, even at the same season of the year, differ considerably in colour, hence the terms of gilt char, red char, silver char, and case char, applied in reference to this diversity.

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* Salmo umbla.

Distinct from the northern char is a species found in some of the lakes of Wales, and more particularly in the deep Llyn Cawellyn, on the side of Snowdon. It is the Welsh char of Mr. Yarrell, and the torgoch or red belly of the Welsh.*

This fish is comparatively deeper and stouter than the northern char, with considerably larger fins, a large eye, and much wider gape. The flesh of this species is excellent, but is little known beyond the territory adjacent to the waters, which the fish has long tenanted. It is abundant in the lake Cos-y-gedawl, in Merionethshire.

THE GRAYLING.†

In many of the clear rock or gravel-bedded streams of our island, a beautiful fish, called the Grayling, or Umber, is very abundant; it is found in the Trent and Dove, and in the Wye, at Bakewell; the streams of Hampshire and Wiltshire produce it; several rivers in Wales, Yorkshire, Lancashire, and Cumberland are also noted for it. This elegant fish is no less beautiful than excellent for the table, and it comes into season in October and November, when trout is out of condition, its breeding time being April or May.

THE CHAR.

It is remarkable for the height of the first dorsal fin, which is crossed with square dusky spots; the head and back are dusky brown, the sides of the body of a light yellowish-brown, with golden, green, and blue reflections, and about fifteen dusky longitudinal lines, with scattered black spots; the head is small and the scales are large. It varies from nine to fourteen or fifteen inches in length; but examples are mentioned of some of these fish, of rare occurrence, weighing from four to five pounds.

The grayling feeds on insects, small molluscs, &c., and rises like the trout at the angler's bait, but less dashingly. It has always appeared to us a less vigorous and active fish than the trout, and by no means so capable of stemming the force of a rapid current, nor have we ever observed it leap out of the water, as we have so often seen the trout, on a calm morning in May, while the May-flies, "thick as autumnal leaves in Valombrosa," were dancing over the stream.

The grayling is caught in all respects like trout, except that it is not a fish of prey, and does not take a minnow. It is usually found in deeper waters than the trout; and its best season is November, while that of the trout is in May or June.

When freshly taken from the water, this fish has a peculiar aromatic and agreeable odour, which should not be allowed to fade before it is dressed for the table. Walton thus writes respecting this fish: "Gesner says, that in his country, which is Switzerland, he is accounted the choicest of all fish," &c. "Some think he feeds on water-thyme, and smells of it at his first taking out of the water;" from this thyme-like odour originates the generic term, *thymallus*.

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* Salmo salvelinus: Donovan.

† Thymallus vulgaris.

In some of the lakes of Ireland a fish of this family, termed the Pollan, exists abundantly; and in the lakes of Wales and Cumberland a fish called the Gwyniad,* or Schelly, is found. A fish, known as the Vendace,† tenants the lakes of Dumfriesshire.

THE SMELT.‡

This delicate little fish, noted for its cucumber odour, breeds in the fresh water, and resides there throughout the greater portion of the year. It is not found along the line of our southern shores, from Dover to the Land's End, but is common in several parts both of our west and eastern shores, migrating in August up the rivers, where it remains till May, its breeding time being in March.

At one time the Smelt advanced up the Thames as far as Hammersmith; but various causes have combined, of late years, to deter the advance of the shoals which enter the Nore and the Medway, where the fishing is carried on from the 28th of August to Good Friday.

Large quantities of these fish are taken on the Lincolnshire coast, in the Tees and Humber, in the Frith of Forth, in the Solway Frith, and in the Dee and Mersey. Experiments show that it will not only live, but thrive, in fresh-water ponds, or in sheets of fresh water which have no communication with the sea, so that it might easily be converted into a lake fish, without any deterioration of its quality.

Passing now from the Salmon family, we come to one scarcely, if at all, less remarkable.§ The fishes of this division may be distinguished by their wanting the adipose fin, by having the upper jaw composed of the intermaxillary bones in the middle and the maxillaries at the sides, and by the body being always covered with scales.

THE HERRING.‖

The term Herring is the same as the German Häring, which, according to some, is derived from Heer, an army, and is applied to these fishes from their visiting the coasts in such immense numbers. Pennant described the migration of these fishes in vast shoals from the high northern latitudes, dividing and subdividing, as islands and capes of the mainland severed their ranks; and though his statement has repeatedly been copied, it has been proved at variance with fact. Crantz, in his "History of Greenland," says, "The proper herring does not come into this latitude;" but he adds, "some few are taken in the south, probably wanderers." On the other hand, he notices a distinct but far smaller species as common. His words are: "The Greenlanders have their most common food from their angmarset, or small herring, a kind of lodden, called by the Newfoundland men *capelin*,¶ near half a foot long; their back is dark green, and their belly silver white. Like herrings, they swim into the bays in such quantities, to lodge their spawn on the rocks, that the sea looks black, and is ruffled or curled. They make their first appearance in March or April, and the common gull is their betrayer. They spawn in May and June, and this is the Greenlanders' harvest, when they lade out whole boats' full in a few hours, with a hoop-sieve, knit with sinews. They dry them on the open rocks in the air, and then pack them up, and lay them by for winter, as their daily bread." The fact is, that the herring is a deep water fish, advancing towards our shores for the purpose of breeding, and thence retiring to the deep again.

THE HERRING.

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* Coregonus fera. † C. Willughii. ‡ Osmerus eperlanus. § Clupeidæ. ‖ Clupea harengus: Linnæus.

¶ Dried capelins are sold in the London markets; they have a peculiar flavour, but some persons like them.

The herring spawns in October, or the early part of November; and about three months previously to this they assemble in vast shoals, and gradually approach our coast, sometimes frequenting for years certain localities, which, from some cause not well understood, they do not again visit, or only in trifling numbers. Hence it happens that the various herring stations around our coast experience great fluctuations, not only as to quantity, but also as to the time of the arrival of the shoals.

Young herrings, yawlings, or herring sile, as they are called, are abundant in shoals around our coast during the whole of the summer, tenanting the shallows, and roving about as instinct prompts them. At one time they continued during the autumn and winter in the estuary of the Thames.

Mr. Yarrell is of opinion, from repeated examinations, that they do not mature any roe during their first year; and hence they are not impelled to retire to the deep sea, but haunt the coasts. The weight of spawn in the herring is 480 grains, and the number of eggs between 3,000 and 4,000. This spawn has been thrown ashore in Orkney, found around the Isle of Man, and all along the western shores of Scotland, and in the western lochs. A greater degree of observation would most probably prove that it is deposited around the British coasts generally, particularly the coast of Scotland. Herrings are usually taken by what is called the stow-boat net. Scotland was long in awakening to a sense of the importance of the herring fishery. In 1826, however, the Scottish fisheries employed no less than 10,633 vessels and boats, with crews of 44,695 fishermen, who handed over the raw material to 76,041 salters. Here, however, their obligations, as well as others, should be remembered to William Beukelings, who died four centuries before, but who discovered or introduced a better mode of packing the fish in layers in barrels, instead of salting them in irregular loose heaps, through which the best of the fish were lost: for now the Scotch herrings were preferred to the Dutch at Hamburg.

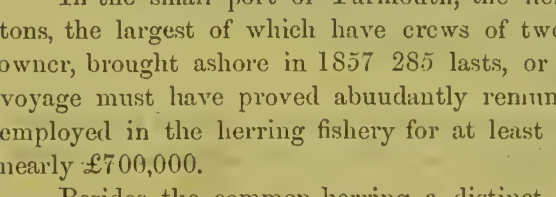
In the small port of Yarmouth, the herring fishery employs 400 vessels, from forty to seventy tons, the largest of which have crews of twelve men. Three of these boats, belonging to the same owner, brought ashore in 1857 285 lasts, or 3,762,000 fish; and as £14 is the price of a last, the voyage must have proved abundantly remunerative. From 4,000 to 5,000 men in Yarmouth are employed in the herring fishery for at least two months in the year, and it brings into circulation nearly £700,000.

Besides the common herring, a distinct species visits our coasts in autumn. It is called Leach's herring.[*] It is smaller than the former, not exceeding seven inches and a half in length; it is much deeper than the common herring, and differs, moreover, in the number of the fin-rays and of the vertebræ, and in its flesh being much more mild in flavour. It is taken in Cardigan Bay, and various bays and lochs in Scotland.

THE PILCHARD.[†]

On our southern coast, and especially that of Devonshire and Cornwall, this fish is taken in great abundance, at certain seasons of the year. It does not travel so far northwards as the herring, but contents itself within temperate latitudes. The pilchard much resembles the herring, but is shorter and thicker.

A fisherman, alive when the record was made, was once at the taking of 2,200 hogsheads of pilchards in one sean; and an instance has been known where 10,000 hogsheads have been taken on shore in one port in a single day, thus providing for human sustenance no fewer than 25,000,000 of these fish. The number of pilchards in each hogshead is 2,500.



THE PILCHARD.

When a very large number are caught, it is the practice to take out of the net only so many at one time as the boats can conveniently carry, and several days may elapse before the whole are secured. By this arrangement, the process of setting, or curing, is properly performed; whereas, if the whole were brought on shore at once, many would be spoiled, from the impossibility of getting through the work in proper time.

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[*] Clupea Leachii.

[†] Clupea pilchardus.

THE SPRAT.*

In Scotland, the Sprat is called the Garvie Herring; but the features in which it differs from the herring or the pilchard are distinguishable even during the darkest nights. In the pilchard, the line of the abdomen is smooth, and in the herring this part is not serrated; but in the sprat the line of the abdomen consists of a strongly serrated edge. This fish is about six inches in length, and above an inch in depth; its colour is of a dark blue and silvery white, with green reflections.

THE WHITEBAIT.†

This little fish has long been a visitor to the Thames, remaining in the brackish water from the beginning of April to the end of September. It was regarded by some as the young of the shad, but the error has latterly been rectified, and Mr. Yarrell has shown it to be a distinct species. The Whitebait is found also in the Hamble, which flows into the Southampton Water, and Dr. Parnell says it inhabits the Frith of Forth in considerable numbers, during the summer months, especially in the neighbourhood of Queensferry.

THE SPRAT.

THE SARDINE.

THE WHITEBAIT.

THE ANCHOVY.

In the Thames, the whitebait advances with the flow of the tide as far as Woolwich, or Blackwall; returning with the ebb to the wider portions of the river, where the water is permanently brackish, and not as at Woolwich, only during high tide. After the influx has arrived at its maximum, whitebait are taken usually by means of a fine bag-net, having a mouth about three feet square; the boat is moored in the tide-way, and the mouth of the net does not dip more than four feet below the surface.

The delicacy of the whitebait needs no comment. Pennant states it to be delicious, and says that epicures of the lower order resort to the taverns adjacent to the places where it is taken, for the purpose of enjoying it. Mr. Yarrell makes the following comment on Pennant's observations:—"What might have been the particular grade of persons who were in the habit of visiting Greenwich to eat whitebait in the days when Pennant wrote, I am unable to state; but at present the fashion of enjoying the excellent course of fish, as served up either at Greenwich or Blackwall, is sanctioned by the highest authorities, from the court at St. James's Palace in the west, to the lord mayor and his court in the east, including the cabinet ministers, and the philosophers of the Royal Society."

THE SHAD.

Mr. Yarrell mentions two species of Shad, the Twaite Shad,‡ and the Allice Shad,§ as entering our rivers at certain seasons of the year, but generally in May. The former is common in the Thames, the latter rare in that river, but abundant in the Severn, as is the twaite shad also. These fish inhabit the northern seas, and, assuredly, are "the large sort of herrings" mentioned by Crantz, as occasionally taken along the south of Greenland.

The allice shad exceeds the twaite shad in size, and usually weighs about four pounds; the latter seldom weighs two pounds, and is a far inferior fish for the table. It differs from the larger species in having teeth, and being marked with several dark spots in a line along its silvery sides.

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* Clupea sprattus.

† Clupea alba.

‡ Alosa finta.

§ Alosa communis.

THE ANCHOVY.*

In spawning time this fish is abundant in the shallow waters of the Mediterranean; but it is found, among other localities, in the Bristol Channel. The Anchovies of Provence are specially celebrated. The fishermen's wives are very expert in removing with the thumb-nail the head, gills, heart, and other viscera, before this fish is pickled; and thus prevent the condiments becoming intensely bitter. The consumption of the anchovy, as pickled and as sauce, must be immense.

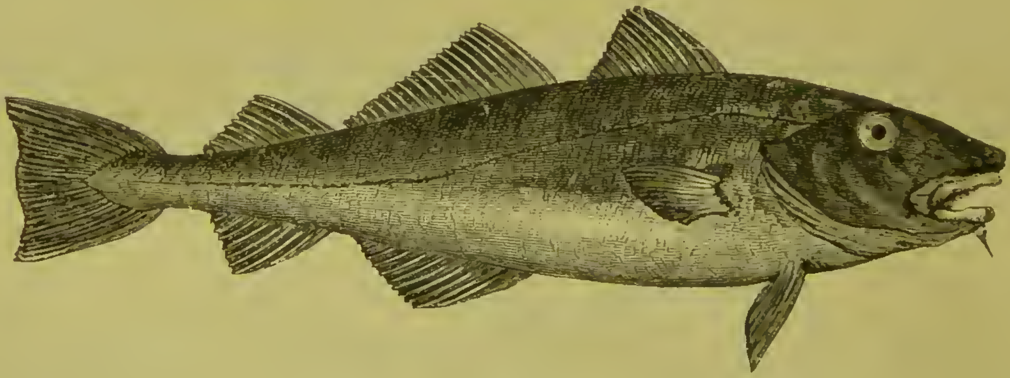
In the genus to which this fish belongs, eleven or twelve species are now known to naturalists. The Sardine belongs also to the herring tribe. These fish are taken in considerable quantities on our coasts, and are exceedingly plentiful on those of Algarve, in Portugal; Andalusia and Granada, in Spain; and along the shores of Italy. When perfectly fresh they are accounted excellent fish; but are used by us pickled, like anchovies.

A second division has been formed of the present order of fishes.† It is one in which the ventral fins are placed immediately below the pectoral; the internal bones sustaining the latter, and giving attachment to those supporting the former as a fixed base.

The first family ‡ contains many species. The larger number of them live in the cold or temperate seas, and furnish the greater portion of the fish obtained in the fisheries of Europe and America. The flesh of most of the species is white, easily separable into flakes, is agreeable to the taste, and easy of digestion. Their reproductive powers are very great, and the number in which they exist in some parts of the ocean is beyond all calculation.

THE COD. §

Two varieties of this fish—the long-nosed, dark "Doggerbank Cod," and the blunt-nosed, yellowish "Scotch Cod"—are widely spread in the seas of Europe and North America. Formerly the London market was supplied from the Doggerbank and Scotland; but more recently, numbers have been procured from the coasts of Lincolnshire, Norfolk, Suffolk, Essex, and also from Ireland.



THE COD.

This fish is especially abundant on the eastern coast of America, where it occupies, between forty and sixty degrees of north latitude, all the bays and shallows to the extreme edge of the Great Bank of Newfoundland. On the approach of spring, regular fleets have been sent out for its capture. England has supplied more than 2,000 ships, with 30,000 men; France, half that number; and America as many as both these countries. Each ship, during the season, has averaged, it is believed, 40,000 fish.

The cod inhabits deep water, varying from twenty to forty-five fathoms, where sand-banks afford a favourable feeding-ground. In such situations are assembled a diversity of creatures adapted to gratify its great voracity. Weaker fish, crabs, and molluscs, are its prey.

As the cod keeps to the ground at the bottom of a deep sea, hooks and lines are employed in taking it, variously arranged on different parts of the coast. One mode is by bulters. We must suppose a long rope, to which, at given intervals, short lines of five or six feet long are attached, at a distance from each other of more than twice their length, to prevent the entanglement of the hooks; each of these short lines, or snoods, is armed with a hook, and above the threads of the line are loosely arranged in parallel order, to prevent the teeth of the fish from snapping off the hook and escaping. In slack streams, this long array of lines and hooks is deposited in the water, and secured at full stretch with buoys, buoy-ropes, and grapples. The main rope is shot across the tidal influx, by which means the snoods and their hooks are carried out from the bulter line, and thus disposed in due order. Various small fish, and whelks, limpets, &c., are used for baits. The fishermen now wait the flow and ebb of the tide; they then examine their lines, and disengage the fish held captives. Sometimes a little cork is fixed about six inches from each hook, to raise the bait a little above the mud or sea-weed, thus presenting it more conspicuously as a tempting morsel to the fish.

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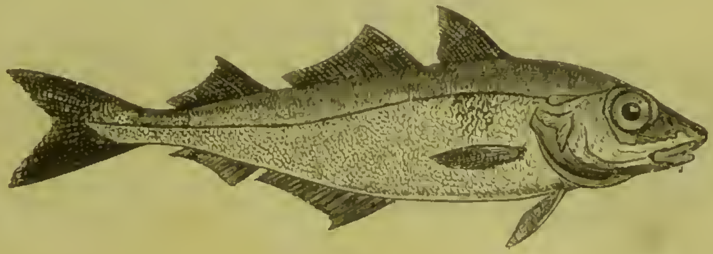
* Engraulis vulgaris. † Malacopterygyii sub-brachiales. ‡ Gadidæ. § Morrhua vulgaris.

In other instances, various sorts of hand-lines are used, each armed with two hooks; one man manages two of such lines, and the number of fish taken by the fishermen of a single vessel is often very great. Mr. Yarrell says that he was told by the master of fishing vessels trading for the London market, that eight men, fishing under his orders, off the Doggerbank, in twenty-five fathoms of water, have taken eighty score of cod in one day.

The cod, after their capture, are transferred to well-boats, which come up the river as high as Gravesend, with the fish alive, the water being so far sufficiently brackish. From this depôt they are sent, by speedy conveyance, to Billingsgate. The salted sounds, or air-bladders of the cod, are sold in the London market, and salted cod is well known.



THE HADDOCK.

Cod-fish is in perfection from the end of October to Christmas; the breeding season is in February, and nine millions of eggs have been found in the roe of a single female. During the summer and autumn, young cod-fish abound round our shores, and advance up the estuary of the Thames; they acquire a length of twelve or fifteen inches before winter; numbers are taken by means of lines.

Large cod-fish are not uncommon; Pennant records one of the weight of seventy-eight pounds, caught at Scarborough; and Mr. Yarrell, one of sixty pounds, caught in the Bristol Channel. But such fish are very indifferent. In some of the salt-water ponds of Scotland, cod are kept in a sort of preserve, and well supplied with food.

THE HADDOCK.*

THIS fish, remarkable for a black mark on each side of the back, is seldom more than two or three pounds in weight, though some are mentioned as weighing ten and even sixteen pounds.

The coasts of the British islands abound with immense shoals of the Haddock, wandering about in quest of food, but never making their way into the Baltic or the Mediterranean. The breeding season is February or March. Haddocks are caught by trawl-nets, and also by hand-lines.

THE WHITING.†

ON our coasts, and those of Holland and France, as well as on the various banks of our seas, this fish occurs in abundance. It is taken by lines, all the year round, but is best during winter, and is highly valued for the whiteness and delicacy of its flesh. The Whiting usually weighs a pound, or a pound and a half, but is sometimes taken of much greater weight.

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* Morrhua æglefinus.

† Merlandus vulgaris.

THE LING.[*]

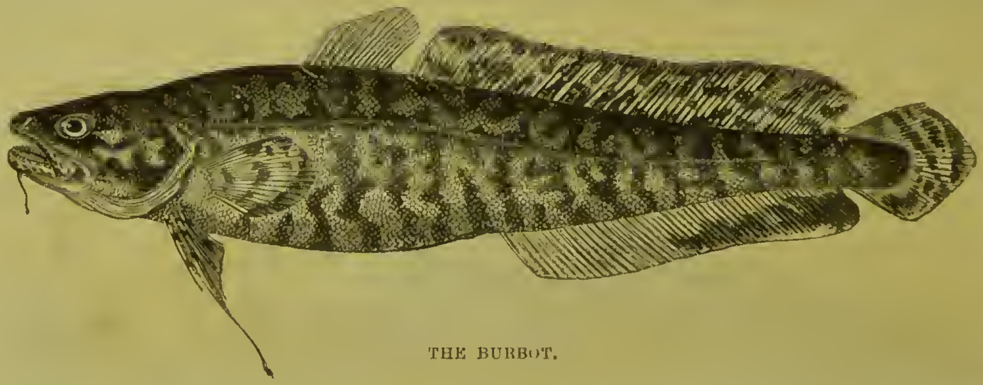
This fish is equally abundant with the cod; it is found in the same seas, and is common on many parts of our coast. It grows to a considerable size, being usually three or four feet in length, and it may attain to seven. It is one of the principal sources of wealth which the sea presents to the enterprise and industry of man.

It is fished in the same manner as the cod; and the sounds, or air-bladders, like those of that fish, are cured separately. The liver yields a plentiful supply of oil, which the poor of the Orkneys and Western Isles use for burning in lamps.

THE BURBOT.[†]

This fish is found in the Trent, the Cam, and some other rivers. It weighs about two pounds on an average, and its flesh is excellent; the largest specimens run to seven pounds' weight. It is fond of lurking in holes, or under large stones, where it watches for its prey.

Its general colour is yellowish brown, marbled with a darker tint, and its surface is slimy. It has been introduced into the Lake of Geneva, and might be placed advantageously in the meres and lakes of Great Britain.



THE BURBOT.

To this family belong several other fish: the Bib and Pout,[‡] the Poor,[§] the Coal-fish,[||] the Pollack,[¶] and the Common Hake.[**]

Passing now to the family of the Flat Fish,[††] as they are usually termed, we cannot fail to be struck by their peculiar shape, and their having both the eyes on one side. These fish are flattened laterally, that is, from side to side. The brown surface of a sole, for example, is only one side, and the white surface on which it reposes another side; while the head is as if it had been wrenched round and crushed flat in a distorted position.

The habits of these fish, of course, accord with their form. Preferring tranquil bays, sandbanks, and spots where the water is muddy, the position of their eyes gives them a great range of vision, while the brown or dark colour of their exposed side blending with that of the bed in which the white side lies, tends to their due concealment.

THE PLAICE.[‡‡]

The Plaice is usually about a foot or rather more in length; of a brown colour above, spotted with red or orange; on the eye-side of the head are some osseous tubercles; the lateral line is curved above the pectoral fin; the body is smooth, and the teeth are blunt and contiguous.

The plaice is abundant on the English coast, wherever sand-banks and muddy beds invite its residence. In Scotland the smaller-sized plaice are called Fleuks. Those taken on a particular station off the Sussex coast, remarkable for the brilliancy of their orange-red spots, are called "Diamond Plaice," and the station is called the "Diamond Ground." The average size is from one to three or four pounds, but the plaice occasionally grows to the weight of ten, twelve, or fourteen pounds. Bushels of them are taken to the London market, and have sometimes been sold at a halfpenny the dozen, each fish weighing three pounds on an average.

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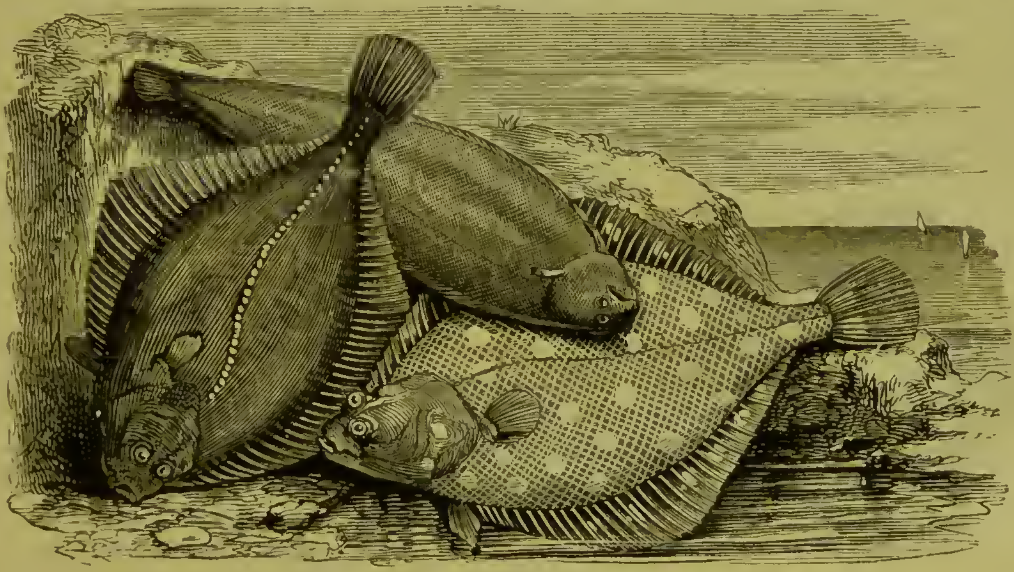
[*] Lota molva. [†] Lota vulgaris. [‡] Morrhua lusca. [§] M. minuta. [||] M. carbonarius. [¶] M. pollachius. [**] Merlucius vulgaris. [††] Pleuronectidæ. [‡‡] Platissa vulgaris.

THE FLOUNDER.*

This very common fish is found in the Thames as high as Teddington; and it abounds in the Mole, the Avon, and the Severn. It will live in fresh-water ponds as well as in the sea; and so tenacious is it of life that it may be sent out of water, with but little difficulty, from one part of the country to another.

Fishermen in the Thames take the Flounder by a tuck-net, which is so managed as to make a circular swoop, inclosing whatever fish may be swimming in that part. It is generally small, but specimens of two or three pounds' weight may sometimes be met with.

The Dab† and the Lemon Dab‡ are examples of the same genus.



THE FLOUNDER, THE SOLE, AND THE PLAICE.

Another genus§ differs from the Plaices proper, in having the body usually more elongated, and the jaws and pharyngeans armed with strong and pointed teeth.

THE HOLIBUT.||

This species is not uncommon on some parts of our coast, and is often exposed for sale in the London markets. It is usually of large size. One taken in the Isle of Man is said to have measured seven and a half feet in length. In the northern parts of Britain it is called the Turbot, but the Holibut is of a much longer form, and is inferior to it in flavour; the flesh, however, as the writer can attest from frequent trials, is good and wholesome.

To another genus¶ belong some fishes of special value.

THE TURBOT.**

The Turbot is of a short and broad form, and rather deeper than many of the flat fishes. Its prevailing colour is brown, and the whole of the coloured side is studded with hard and roundish tubercles. It is called in Scotland the Rawn Fleuk, and the Bannock Fleuk. As the Turbot does not possess the power of rapid motion, it would be liable to speedy extermination by its numerous enemies, were it not so formed and endowed as to render it quick in perceiving danger; while it is also guarded by its habits, which occasion it constantly to be near the bottom, and also by its colour, for while one half of the fish is nearly white, the other half approaches to the muddy colour of that part of the element in which this fish resides. The position of the eyes is also singularly adapted for securing its safety. They are not placed on each side of the head, but only on that side which is uppermost when it is in motion.

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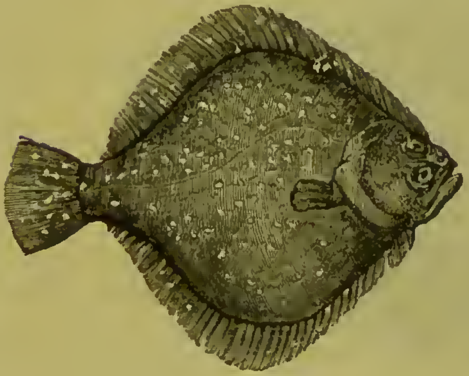
* Platessa flesus.
† P. Limanda.
‡ P. microcephala.
§ Hippoglossus.
|| H. vulgaris.
¶ Rhombus.
** Rhombus maximus.

The turbot is most active in the night-time, when, perhaps, its enemies are less vigilant; and in the day-time it lies at the bottom, with its dark side uppermost, and is consequently difficult to be distinguished. It is said that, when apprehensive of danger, it will remain perfectly still. Man is, probably, its most active enemy. Great care is necessary in having a suitable bait; for, though voracious, the turbot is delicate in its choice of food. A piece of herring or haddock is commonly used for a bait, but if it has been twelve hours out of the water, though not tainted, the turbot will not take it. Many years ago, and it may still be the case, the Dutch purchased of the Thames fishermen the lesser lamprey, for bait, to the value of £700 a year. The Scarborough fishermen were accustomed to obtain a supply by land carriage from the river Wharf, a distance of about sixty miles.

The fishery is carried forwards on the north-eastern coast. Each person is provided with three lines, which are fairly coiled upon a flat, oblong, piece of wicker-work; the hooks being baited, and placed very regularly in the centre of the coil. Each line is furnished with fourteen score of hooks, at the distance of six feet two inches from each other. The hooks are fastened to the lines upon "steads" of twisted horse-hair, twenty-seven inches in length.



THE TURBOT.

When fishing, there are always three men in each coble, and consequently, nine of these lines are fastened together, and used as one line, extending in length nearly three miles, and furnished with two thousand five hundred and twenty hooks. An anchor and a buoy are fixed at the first end of the line, and one more of each at the end of each man's lines; in all, four anchors, which are commonly perforated stones, and four buoys, made of leather or cork. The line is always laid across the current, and remains on the ground about six hours, as it can only be shot or hauled at the turn of the tide. The rapidity of the tide on this coast prevents the use of hand-lines, and therefore two of the men commonly wrap themselves in a sail and sleep, while the other keeps a sharp look-out, to observe the weather, and from fear of being run down by ships.

The coble is about one ton in burden, rather more than twenty feet long, extreme breadth five feet, and it is rowed with three pairs of oars. A larger description of boat is also used in the Scarborough turbot fishery. It is forty feet long, fifteen broad, and of twenty-five tons burden, and is called the "five men boat," though usually navigated by six men and a boy; but one of the men is hired to cook, and does not share in the profits with the other five. Two cobles are taken on board, and when they reach the fishing ground they anchor, and proceed to fish in the cobles, and being provided with a double set of lines, they haul one and shoot another every turn of the tide. They generally run into harbour twice a week, to deliver their fish. Similar means are employed along our southern coasts, but the London market is chiefly supplied by the Dutch fishermen.

The fishing season commences in March, and terminates in August. The Dutch are supposed to have drawn not less than £80,000 a year, for the supply of this fish to the London market alone. The English fishermen purchase at sea largely of the Dutch; nevertheless, the Dutch send boats laden with turbot up the Thames, each boat bringing about one hundred and fifty fish. The Danes also are said to derive from £12,000 to £15,000 a year for sauce to this luxury of the table, extracted from a million of lobsters, taken on the rocky shores of Norway, though our own shores are in many parts plentifully supplied with this creature, equal in goodness to those of Norway. The finest turbot are taken on the Flemish banks, and the banks called Broad Forties. Excellent fish are also taken by the French fishermen, on the two large sand-banks called the Varne and the Ridge, stretching towards the French coast in the Channel, not many miles from Dover. These they sell to the English out at sea, or send into Dover.

The average size of turbot is from three to ten pounds weight; but some of huge size have been occasionally taken, which have weighed from fifty to seventy pounds; and one was caught in 1832, near Whitby, which weighed one hundred and ninety pounds.

THE BRILL.*

The Brill is very similar to the turbot in appearance, but inferior in flavour. It is taken with lines and hooks, the baits being mussels, cockles, sand worms, and herrings, cut in pieces. It is common in the markets, and may at once be distinguished by its less broad form, the want of the osseous tubercles on the coloured side of the body, and the colouring, which is reddish or sandy-brown, varied with darker brown, and minutely spotted with white. This fish is the Bonnet Fleuk of the Scotch. It often attains an enormous size, is abundant on our southern coasts, and all the localities where the turbot occurs. It inhabits deep water and sandy bays.

Another genus† contains the Soles, which are distinguished generally by their more elongated form, and the blunt and rounded state of the muzzle.

THE SOLE.‡

This is one of our most valuable fishes, and is found around the shores of our island, and along those of the adjacent continent; it exists in the Baltic, and also in the Mediterranean. It usually tenants beds of sand, where it feeds on shelly molluscs. The Sole is taken by the trawl-net, and there are numerous fishing stations along our coast, especially off Sussex and Devonshire, where vast numbers are captured, the supply appearing inexhaustible. The sole is in season all the year round, excepting during the latter part of February, when its flesh becomes flabby. In a few weeks, however, it recovers and continues in excellent condition. Mr. Yarrell states that, in the course of one twelvemonth, eighty-six thousand bushels of soles were received at Billingsgate Market. Occasionally, this fish is to be seen of large size, weighing eight or ten pounds the pair; and there is an account of one by Mr. Yarrell, which was twenty-six inches long, eleven inches and a half wide, and weighed nine pounds. It was in the Totness market, June 21, 1826. Torbay is noted for its fine soles, and extensive sole fishery. The sole will live and thrive in fresh water, and numbers reside and breed in the brackish water of the Arun, from its mouth to a distance up the stream of five miles. They are said to be of excellent quality. These Arun soles are reported to bury themselves in the sand or mud, during the cold months; the season for trawling for them extending from May to November.

An allied species, the Lemon Sole,§ first described by Mr. Yarrell, is occasionally taken off the Sussex coast; it is wider in proportion and thicker than the common sole, and its colour is a light brown, with a mixture of orange yellow.

One species of a sub-genus|| is found on the British coast, and is called the Variegated Sole and the Red-Backed Flounder,¶ as well as by other names. There are, however, certain soles in which the pectoral fins are altogether wanting; and Lacépède has constituted them into a sub-genus.**

We now proceed to another order of osseous fishes††—the Footless; they are so called because they are destitute of ventral fins. They are elongated in form, and have a soft, slimy skin, which is not without minute scales.

THE EEL.

The Eel, humble as it is in the scale of being, is well worthy of minute examination. Its scales, which are very minute, are covered over thickly with a slime-like material, and hence the proverb, "slippery as an eel." The microscope will show that each scale is beautifully ornamented; and the exquisite pattern formed by the scales on the skin may be easily seen, if a bit of it, when fresh, be placed on the window-glass, and allowed to dry.

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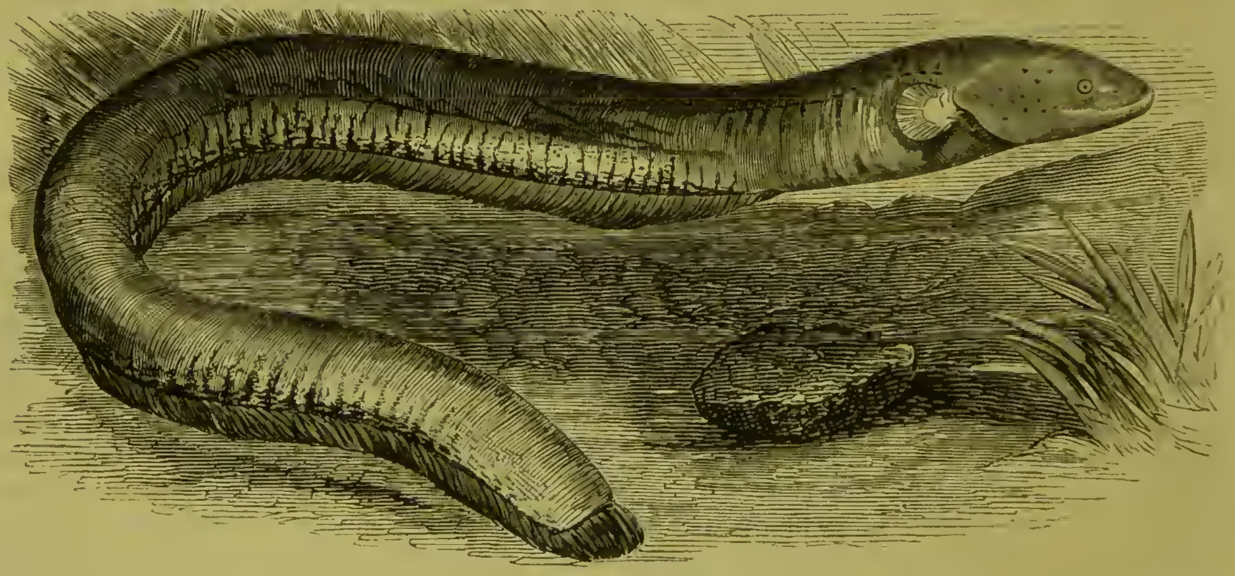
* Rhombus vulgaris. † Solea. ‡ Solea vulgaris. § Solea pegusa. || Monochirus. ¶ M. linguatulus. ** Achirus. †† Apodal.

There are three different species of the fresh-water eel* abounding in this country—the sharp-nosed,† the broad-nosed,‡ and the snig.§ A fourth has been found in some countries, but so very rarely in England, that it is not even mentioned by many naturalists. There is so much similarity between these species that they were confounded together, until within the last few years.

Mr. Yarrell, in his interesting work "On British Fishes," gives the following description of the appearance of the sharp-nosed eel:—"The head is compressed, the top convex, depressed as it slopes forward; the eyes small, placed immediately over the angles of the mouth; irides reddish yellow; the jaws very narrow, slightly rounded at the end; the lower jaw the largest; nostrils with two openings on each side, one tubular, the other a simple orifice; both jaws furnished with a narrow band of small teeth; gape small; various mucous pores about the month and other parts of the head; gill-opening a small aperture immediately before and rather below the origin of the pectoral fin; the scales on the body rather small; dorsal fin extending over more than two-thirds of the whole length, both united at the end, forming a tail; the number of rays in the fins not easily ascertained, from the thickness of the skin; the lateral line exhibits a long series of mucous orifices; vertebræ 113." The difference between the three species are very slight, being principally in the form of the vertebræ.



THE GYMNOTUS, OR ELECTRICAL EEL.

Eels are of slow growth, scarcely reaching the length of twelve inches during the first year; but they afterwards attain to large dimensions. Mr. Yarrell saw, at Cambridge, the preserved skins of two eels, which weighed together fifty pounds, the heavier being twenty-seven pounds.

Fish, as a rule, do not live more than a few minutes out of the water; but an eel will remain alive for many hours, and even days, in atmospheric air, provided it is laid in a damp place. Now, if one be watched when placed on dry land, it will be seen to pout out his cheeks on both sides of his face. Underneath this puffed-out skin are its gills, and the skin over them is so arranged as to form a closed sac, which the eel fills with water, and so keeps the gill-fibres moist. This marvellous contrivance of the Great Artificer enables the eel to come out of the water, and to travel, so to speak, on land. Thus eels are often found in outlying ponds, where they were never placed by the hand of man. Finding their quarters uncomfortable, therefore, they take in a good supply of water, and change them for the better. Some fish leap towards the water, but the eel passes onwards by a snake-like progression.

The Scotch peasantry dislike eels, it is said, because of their snake-like form; but in the South of France they eat not only eels, but snakes. A visitor relates that, in ordering eels for dinner in a small town there, he was asked if he would have *Anguilles de la haie*, that is, "eels of the hedge," or snakes, or *Anguilles de la rivière*—"eels of the river." He ordered the latter, though snakes are considered by some good eating, when cut into bits, and nicely dished up.

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* Murænidæ. † Anguilla acutirostris. ‡ Anguilla laterostris. § Anguilla mediorostris.

> "For Trent eels and Witham pike
> England cannot show the like,"

is a couplet long familar to the dwellers in Nottinghamshire and Lincolnshire. The writer has rarely seen the former equalled, and never surpassed; and to their delicacy under the culinary art multitudes can bear witness; while "Eel-pie House" is an inscription that may still be met with in London and the provinces. Eels are captured in a variety of ways.

A species of eel* has the power, in common with some other fishes, of giving, to any living body which touches them, a shock resembling in its effects that produced by the discharge of a Leyden jar. This is of very variable intensity in different species and individuals, and at different times. The *Gymnotus* will attack and paralyse horses, as well as kill small animals.

THE CONGER EEL.†

The Conger Eel is easily distinguished from the fresh-water species, by the upper jaw being the longer, the dorsal fin commencing much nearer the head, and particularly by its greater size. It is often five or six feet in length, and occasionally as much as ten feet and upwards; the thickness bearing about the same proportion to the length as the common eel. The upper parts of the body are brownish, and the under parts dirty white; the dorsal and anal fins are whitish, margined with deep bluish black; the lateral line is spotted with white. This species, found in most of the European seas, is common on many parts of our coast. It is taken by night from boats or vessels, by hand lines, or on long lines, with sand-worms, herring, or pieces of any fish.

The conger eel is exceedingly voracious, and when caught with a hook and line, requires great care to haul it in and take out the hook. Nor is its capture unattended with danger, the jaws of a conger having been known to close on the foot of a fisherman, and severely to wound him through his shoe. Another, six feet in length, was caught in the Wash at Yarmouth, in April, 1808, but not without a severe struggle with the man who had seized it. It is said to have risen half erect, and to have knocked him down before it was secured. Its weight, however, was only sixty pounds.

A young specimen of this fish has lived in one of the tanks of the Zoological Gardens since 1853. On its arrival it measured only five inches, but by the account published May, 1860, was then upwards of two feet in length. It passed most of its time, according to J. Tennent, the keeper of the fish-house, in a hole it excavated under some of the rock-work, and in the cold weather never moved from its shelter; but during the summer months would often come out to be fed at a signal from the attendant.

THE MURŒNA.‡

This fish was greatly esteemed by the epicures of ancient Rome. It is noted for its voracity and the severity of its bite. The ground colour of the anterior parts is a fine yellow, of the hinder parts a rich purple; the whole surface being marbled with somewhat annular markings, and sprinkled with innumerable spots of white, yellow, golden brown, and purple.

THE SAND LANCE.§

This little, slender, eel-like fish, of a silvery brightness, is known as the "riggle" on the coast of Sussex. Its singular and projecting under jaw enables it to burrow in the sand, which it does on the ebbing of the tide, and it emerges from its hole on the reflux. It is captured in large quantities, principally as a bait for the sea-lines, and bushels of it are sold to the French fishermen.

Another family of osseous fishes|| is distinguished by the presence, on the under surface of the body, of a disc, composed of the united ventral fins.

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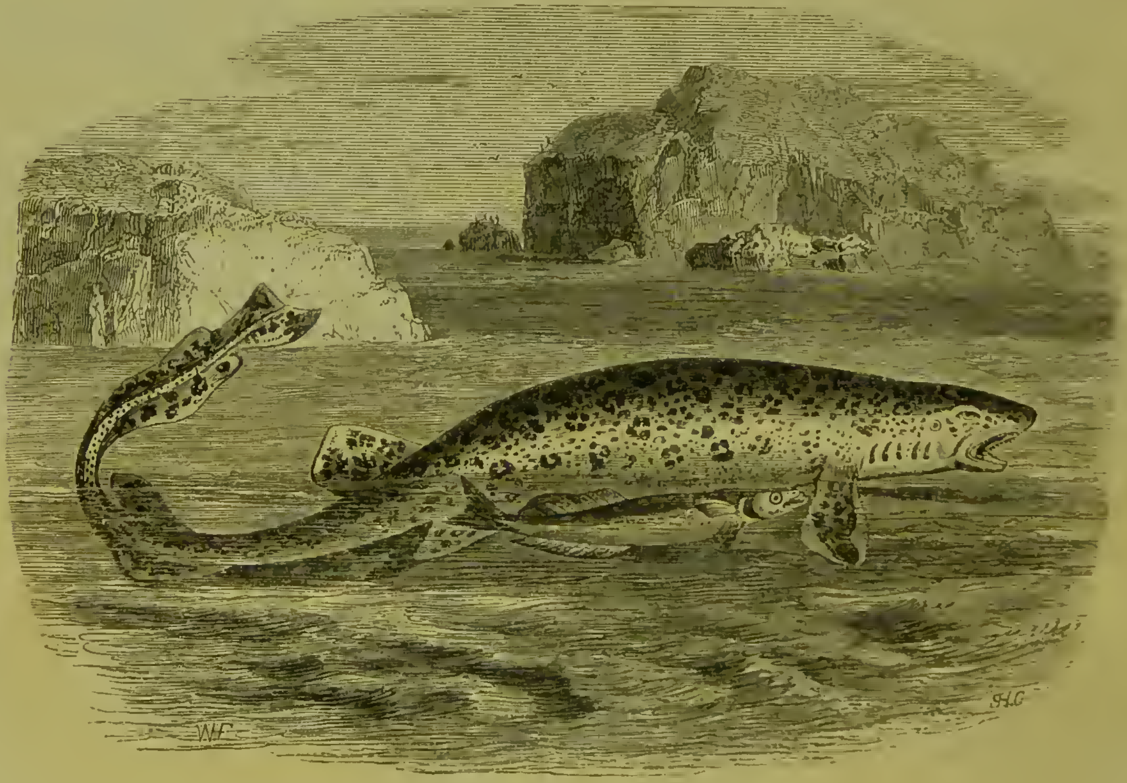
* Gymnotus electricus. † Conger vulgaris. ‡ Murœna Helena. § Ammodytes lanceas. || Discoboli.

THE LUMP SUCKER.*

The Lump Sucker is a common and remarkable species of fish inhabiting the British seas, and belongs to a family popularly known as Sucking Fishes. This one is a large-bodied, small-finned fish, bearing on its back an elevated crest or ridge, and having a powerful sucker under its throat, formed of the combined pectorals and ventrals. Before the spawning season it is of a brilliant crimson colour, mingled with orange, purple, and blue, but afterwards changes to a dull blue or lead colour.

When full-grown it is rough with tubercles, but when very young is smooth and beautiful, and marked with brilliant stripes of various hues. In the seas of the Orkneys, in June, numbers of the young fish, half an inch in length, are seen swimming around floating sea-weeds. In the old fish the sucker is so powerful that a pail of water, containing some gallons, has been lifted up by a person holding the tail of a lump fish adhering to the bottom. It ranges from the shores of Greenland to those of the south of England, and westward as far as the coast of North America. The eyes are large, and, it has been said, "make it look like a cat or an owl," whence one of its common appellations is the "sea-owl." It is taken with lines and hooks; the baits are sand-worms, shell-fish, herring, or sprat cut up.

This strange-looking fish may often be seen exposed to view in the shops of the London fishmongers. Its flesh, and particularly that of the male, is regarded as excellent. It is chiefly in April and May that the lump sucker is taken, as it then approaches the shore for the purpose of breeding.



SUCKING FISH ADHERING TO A SHARK.

Another genus of this family† consists of a number of small fishes, which have two discs on the under surface of their bodies, one formed by the pectoral and the other by the ventral fins. They thus adhere to stones, rocks, and shells. They have wedge-shaped, defenceless bodies, smooth and without scales, often painted with the most defined and brilliant colours. The Sea-Snail‡ is a third genus of this family. They are found under stones at low-water mark, and are not so brilliantly coloured as others of the tribe. They are furnished with a single sucker formed by the united pectorals and ventrals.

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* Cyclopterus lumpus.

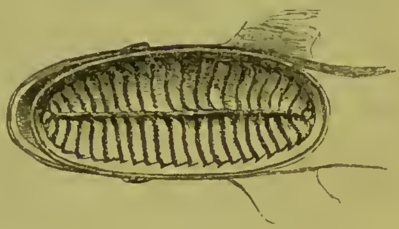
† Lepadogaster.

‡ Liparis.

Another genus* is formed of inhabitants of the tropical seas. The top of the head is provided with a large oval disc, by means of which these animals have the power of adhering to other bodies, and that with astonishing tenacity.

None of these fishes are very large; the body is elongated, and somewhat conical in its figure; the lower jaw advanced before the upper; the eyes are small and lateral. Their own locomotive powers appear to be comparatively inconsiderable, hence they avail themselves of the exertions of other fishes in order to pass through the water. Of these the shark may be especially noticed. To the sides of this huge tyrant of the deep the sucker-fish attaches itself without fear, led by that instinct which teaches it how best to provide for its wants and safety. The sucker-fish also frequently fixes itself to the bottoms of ships, and it was formerly believed to be able to arrest the course of a vessel going with steam and wind.

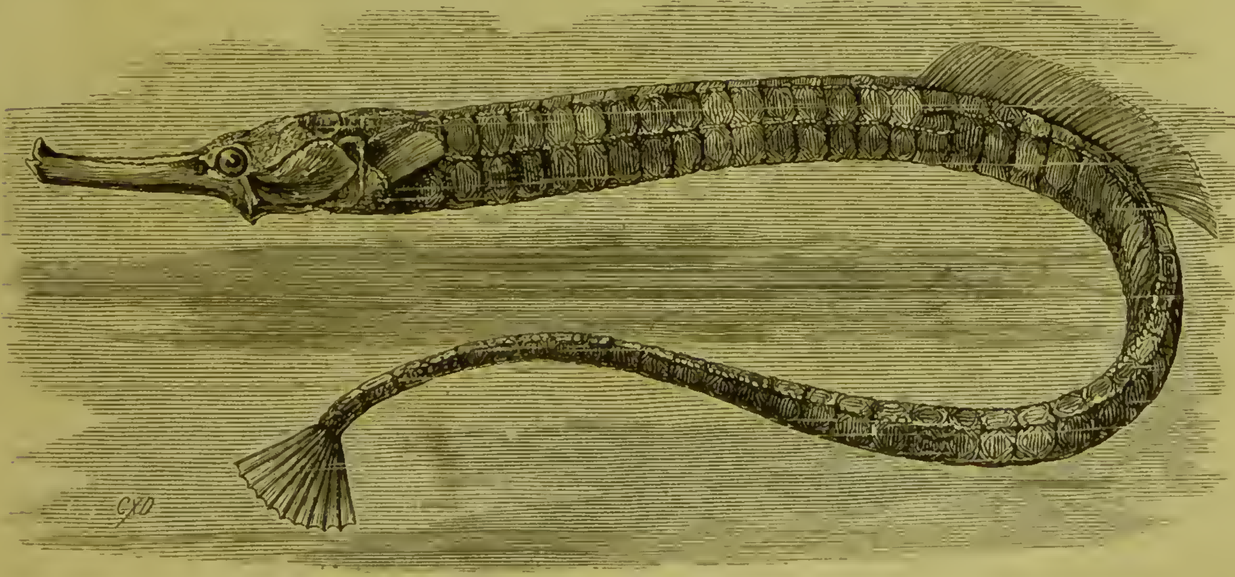
This apparatus, or sucker, is of an oval form, and bears a considerable proportion to the size of the whole animal; it is surrounded by a broad, loose, movable rim, capable of applying itself closely to the surface on which it is placed. Within this rim are two rows of cartilaginous plates, or laminæ, having each a free edge, which is finely serrated; these plates are capable of being raised up or depressed, so as to bring them flat at the will of the animal, there being peculiar muscles on the skull adapted for that purpose. These two rows of plates are separated merely by a thin partition of cartilage, and are thus divided, most probably, in order that being shorter each may gain an increased degree of firmness, so as to be capable of bearing a more intense proportion of muscular force. By means of this apparatus a vacuum is formed, and the fish firmly adheres to any other fish.


HEAD OF SUCKING-FISH.

THE COMMON REMORA.†

THIS fish was known to the Greeks and Romans, and is found in the Mediterranean Sea. There are only a few other species of this genus.

The fifth order of osseous fishes, established by Cuvier, derives its name‡ from the structure of the gills, which present the appearance of little rounded tufts, disposed in pairs along the branchial arches. They are covered by a large gill-flap attached all round, leaving only a small aperture for the passage of the water. These fishes, besides, have the whole body invested in a sort of cuirass, or tesselated



THE GREAT PIPE-FISH.

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[*] Echeneis.

[†] Echeneis remora.

[‡] Lophobranchii.

armour, producing ridges and angularities. To this group belong several species of pipe-fishes found upon our coasts, remarkable for the length and slenderness of their body, and the tenacity and prolongation of the snout into a sort of tube, with a small mouth at its extremity. The males of some of the species have an elongated pouch under the tail, closed by two folding membranes, and in which the eggs deposited by the female are hatched, although the time and mode in which they are transferred to this receptacle is unknown. Unlike most fish, the pouched pipe-fishes are strongly attached to their young, and when danger threatens, the pouch serves them as a place of retreat.

THE GREAT PIPE-FISH.*

THIS fish is one of the most common, and is often kept by the fishermen in a dried state to sell as a curiosity to sea-side visitors. It is from one to two feet in length, when fully grown, and is of a pale yellowish brown, with dark and broad bands at regular intervals. "This species," says Mr. Couch, "may be seen slowly moving about, in a singular manner, horizontally or perpendicularly, with the head downwards or upwards, and in every attitude of contortion, in search of food, which seems chiefly to be water insects." Mr. Yarrell observes, that these fishes "are supposed to be able, by dilating their throat at pleasure, to draw their food up their cylindrical beak-like mouth, as water is drawn up the pipe of a syringe." The male of this species is furnished with a pouch. We have engraved a specimen upon a large scale in order to show the peculiar markings of the fish.

Closely allied to the pipe-fishes are some other remarkable creatures.†

THE SHORT-NOSED HIPPOCAMPUS.‡

THIS fish, often called the sea-horse, is of a singular form, the head resembling that of a hog or tapir, with a slender tubular snout, at the end of which is a small mouth. The neck is arched like that of a horse, and the protuberant abdomen may represent the chest; the tail is long, tapering, and prehensile; the dorsal fin is high; the mail-clad body and tail are traversed by longitudinal and transverse ridges, with angles of intersection. It is to be met with on different parts of our coast. Its general colour is a pale brown, with changeable iridescence, and variable tints of blue. Its total length is about five inches. The males are furnished with a pouch.

THE SHORT-NOSED HIPPOCAMPUS.

Specimens of this fish have, it is said, been occasionally found curled up in oyster-shells; but of their general habits little is known: the following extract from Mr. Yarrell's work is therefore the more interesting:—"At the time of writing, June 9, 1835, Mr. Lukis had two female specimens of *Hippocampus brevirostris*, then healthy and active, which had been living twelve days in a glass vessel; their actions being equally novel and amusing. An appearance of search for a resting place induced me," says Mr. Lukis, "to consult their wishes by placing sea-weed and straws in the vessel; the desired effect was attained, and has afforded me much to reflect upon in their habits. They now exhibit many of their peculiarities, and few subjects of the deep have displayed in prison more sport or more intelligence.

"When swimming about they maintain a vertical position, but the tail is ready to grasp whatever it meets in the water, quickly entwines in any direction round the weeds, and when fixed the animal intently watches the surrounding objects, and darts at its prey with great dexterity.

"When both approach each other, they often twist their tails together, and struggle to separate or attach themselves to the weeds; this is done by the hinder part of their cheeks, or chin, which is also used for raising the body when a new spot is wanted for the tail to entwine afresh. The eyes move independently, as in the chameleon; this, with the brilliant iridescence about the head, and its blue bands, forcibly remind the observer of that animal."

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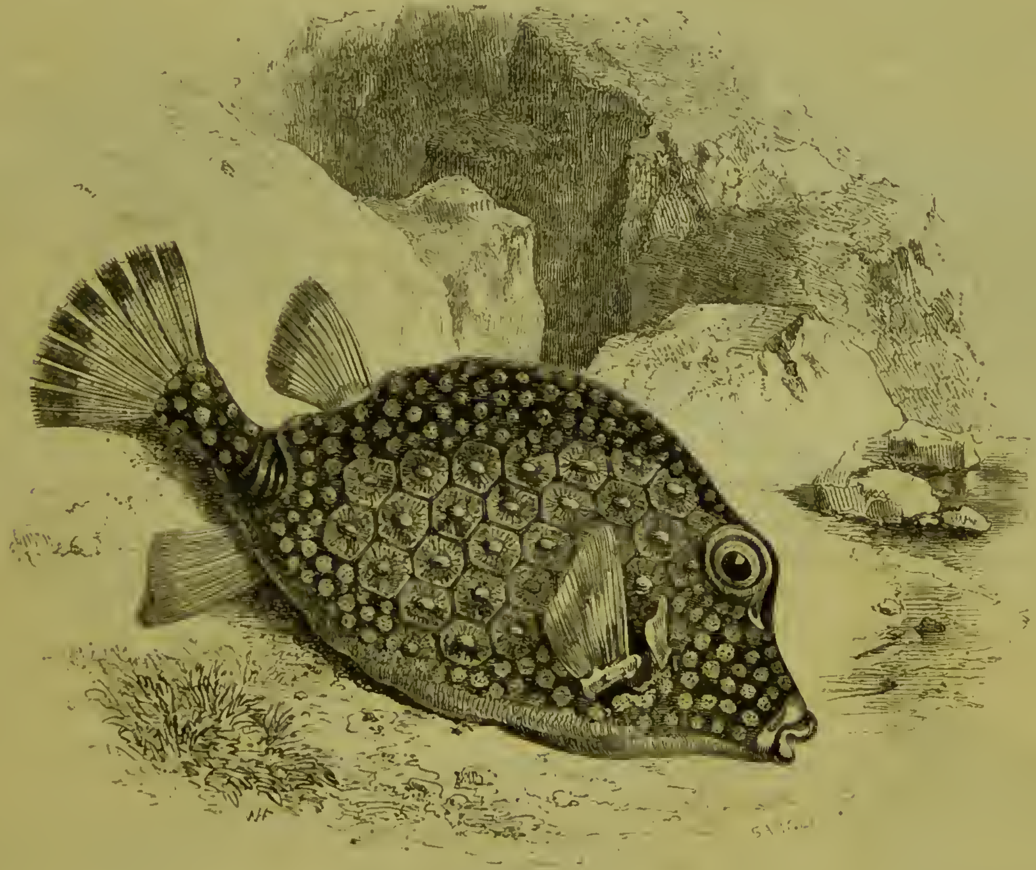
* Syngnathus acus. † Hippocampi. ‡ Hippocampus brevirostris.

THE BOX-FISHES.

The very remarkable genus of the Box-fishes* is restricted to the seas of the hotter latitudes of the two continents—namely, the Red Sea, the Indian, and that which bathes the shores of intertropical America.

As they find their food on the muddy or sandy bottom of the sea, so they reside there, leading a quiet life. Having no power of rapid motion, nor any formidable weapons, they are exposed to the attacks of a thousand rapacious monsters. Against their enemies they have, however, a most admirable protection; for they are enveloped not only in scales, but in a solid, firm, osseous coat of mail—an inflexible cuirass, in fact, which invests the whole of the body, and which leaves at liberty only the extremity of the tail. The different parts of it are, indeed, so well joined together, that the entire envelope which covers the body, both above and below, appears to be formed of a single bone.



THE BOX-FISH.

In some species the osseous envelope of the body is triangular; in others, quadrangular, or with four sides; and in some, sharp spears project forwards before the eyes, like horns; the envelope also is variously marked or tuberculated. The opening to the gills is a long but very narrow slit, before the pectoral fins, and is closed by a movable gill-cover of the same material as that investing the body.

The triangular box-fish,† which is one of the largest of the genus, attains a foot and a half in length. "Its flesh," says Lacépède, "is accounted more delicious than that of almost any other fishes of the American seas, in which it is found." He suggests also that the exquisite flavour and wholesomeness of its flesh, urge strenuous attempts to naturalise it on our European coasts. The quadrangular box-fish‡ is a native of the Indian seas. Its flesh is hard and tasteless.

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* Ostracion. † Ostracion triquoter. ‡ Ostracion cornutus.

THE GLOBE FISHES.

LIKE the box-fishes, these singular tenants of the ocean are slow in their progressive movements. This remarkable group is divided into two genera. One[*] derives its name from having but two tusks, one in each jaw. The skin is armed all over with large, strong, sharp spines, which present an array more formidable than those of the porcupine. The species, like those of the following genus, are all limited to the warmer seas.

The second genus[†] takes its title from having the osseous plate, forming the teeth, divided in each jaw into two portions, so that these creatures may be said to have four teeth. The species of each genus are very numerous.

The globe fishes are all most remarkably constituted. They are covered merely with a multitude of sharp spines, differing in length and number in various species; their number, when they are small in size, compensating for their inferiority. Defended by a host of spears, to be levelled at pleasure, they are safe, for they severely wound the mouth of every fish that ventures to snap at them as a prey, or the hand that attempts to capture them.

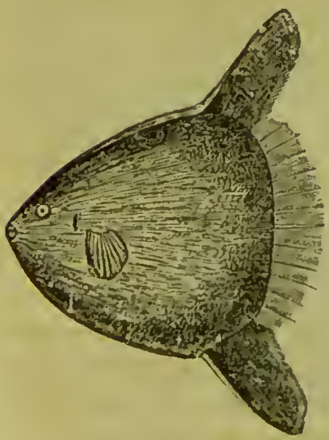
But, independently of these defensive arms, they are endowed with a power which renders them still less exposed to the attacks of their enemies. This power consists in distending themselves with air, so as to resemble a ball of spines, and of floating on the surface of the water. Thus distended and floating, they are always upside down, and so carried along.

When these fishes wish to rise to the surface, in order to avoid danger, they distend themselves to the full, which brings out all the spines in battle array, and so mount rapidly upwards. When they wish to descend again into the deep, they contract the sides of the body, compress the air, assume an elongated form, which is that of the body in reality, and thus gradually sink.

Another genus belongs to a singular family.[‡]

THE SUN-FISH.[§]

Two species of Sun-fish are occasionally seen off our coasts, of which the short sun-fish[‖] is the most common. This fish is of a circular form, and though there is a caudal fin, united to the dorsal fin and the under fin, there is no tail. The jaws are armed with an undivided cutting edge. This fish is very shining; it often grows to a great size, and has been taken weighing three hundred pounds, but such large specimens are very rare. Generally these fishes are observed drifting along as if asleep on their side, but sometimes swimming in the ordinary manner; they keep much at the bottom of the water, and there feed on sea-weeds. They often, however, ascend in calm, sunny weather, and lie basking on the surface, carried along gently with the tidal current.



THE MOON-FISH.

The oblong sun-fish[¶] is larger, longer, and rarer than the one just mentioned. Both have been taken on the British coasts. The Moon-Fish, with its crescent-like tail, bears to these creatures some resemblance.

We have now reached the last order of fishes,[**] distinguished by the cartilaginous substance of which the bones are composed, a circumstance arising from the very small quantity of earthy matter which enters into their composition. This earthy matter is found to be disposed in small granules, and not in distinct fibres, as in the first section.

Four genera are contained in the following family,[††] of which the first species is the most valuable.

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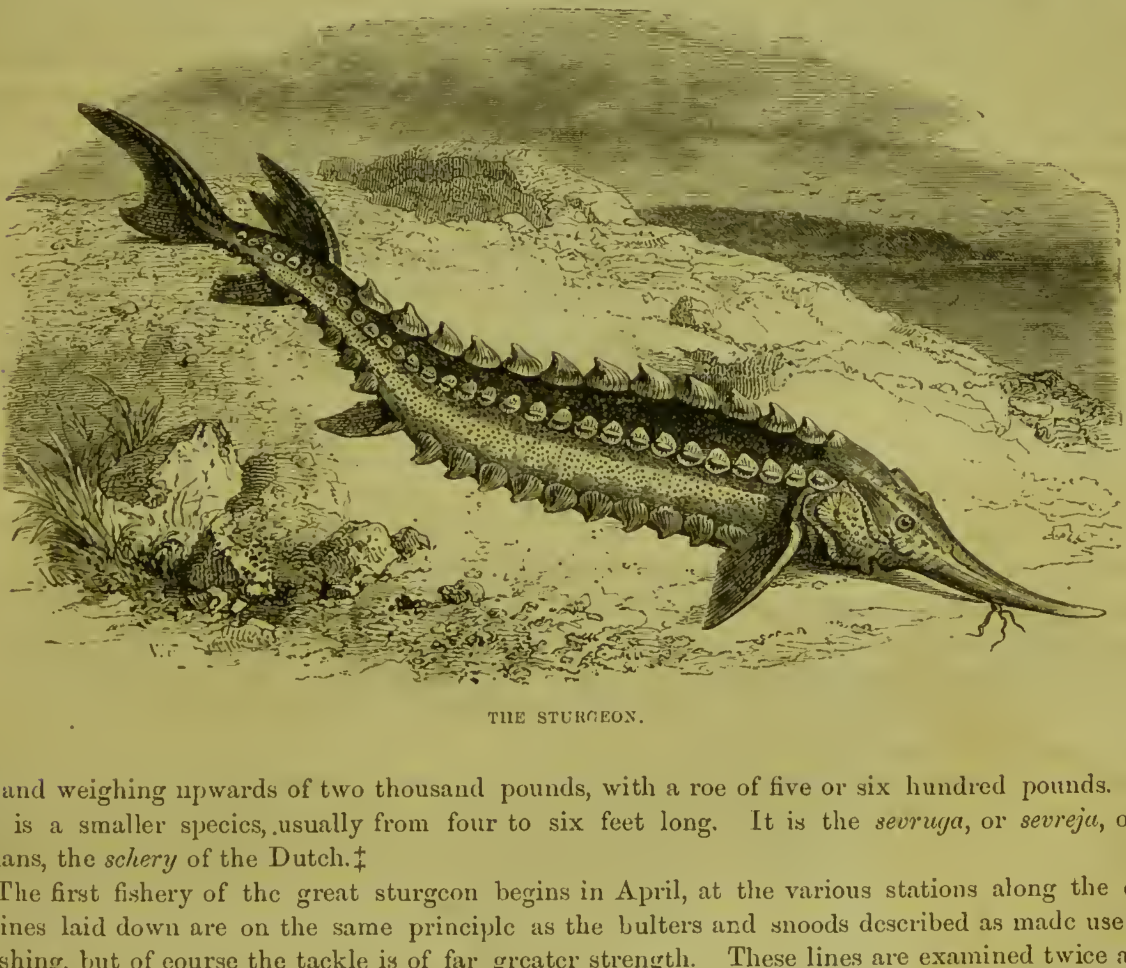
[*] Diodon.
[†] Tetraodon.
[‡] Gymnotontidæ.
[§] Orthagoriscus.
[‖] Orthagoriscus mola.
[¶] O. oblongus.
[**] Chondropterygii.
[††] Sturionidæ: Acipenser, Spatularia, Chimæra, and Callorhynchus.

THE STURGEON.[*]

This fish has a long, pointed, conical snout; the mouth opens underneath, in the throat; the body is elongated, and defended by indurated plates and spines, arranged in longitudinal rows. It is often taken on various parts of our coast, and in the estuaries of rivers, where it is sometimes entangled in the salmon nets. Its struggles are very desperate, and it sometimes occasions much trouble. The flesh of this fish, which is sold in slices, is much esteemed by many; it is firm and white, like veal, and generally prepared as a stew, with a rich gravy; it is also preserved by salting. The roe of the sturgeon, on the Continent, is made into a condiment, called *caviar*, and the best isinglass is prepared from the membrane of the air-bladder. In the Caspian Sea, and in the northern districts of Europe, extensive sturgeon fisheries are established, the roe and air-bladder being the great desiderata. The Russian fisheries on the Caspian Sea are extremely valuable.

In this great inland sea, besides the common sturgeon, two different species exist; one is the great sturgeon, *Le Hausen*, or *Beluga*,[†] which is from twelve to fifteen, and sometimes twenty feet long, and weighing upwards of two thousand pounds, with a roe of five or six hundred pounds. The other is a smaller species, usually from four to six feet long. It is the *sevruga*, or *sevreja*, of the Russians, the *schery* of the Dutch.[‡]



THE STURGEON.

The first fishery of the great sturgeon begins in April, at the various stations along the coast. The lines laid down are on the same principle as the bulters and snoods described as made use of in cod-fishing, but of course the tackle is of far greater strength. These lines are examined twice a day, the fish which are caught are disengaged, and when a rope from shore is passed through their gills they are put into the water, to be kept alive till the time for cutting them up arrives. A single vessel will sometimes capture fifty of these fish in twenty-four hours. The work of cutting up these fish is managed on planks, along the shore. The sounds are obtained by the isinglass makers; the roes are put into tubs, of which the preparers of caviar take the charge; the fish are then cleared of refuse, cut up, and put in layers into brine vats in underground cellars, for the sake of coolness; after this, they are taken out, again sprinkled with salt, and placed on layers in store cellars lined with ice. One or more large vessels are continually passing to Astracan from the fisheries and back again, bringing salt and needful implements, and returning with salt-fish, caviar, isinglass, and fish-skins, which latter, in some parts of Russia and Turkey, are made into a sort of leather, or used, when prepared, instead of window-glass.

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[*] Acipenser sturio.

[†] Acipenser Haso.

[‡] Acipenser helopa.

After the spring fishery of the great sturgeon is over, that of the sevruga commences, and lasts about a fortnight. This fish is very abundant, and a single fishing-vessel, or vataga, sometimes takes from fifteen to twenty thousand. The total number taken in one season has been calculated at 1,300,000, affording the value of £16,000 in isinglass, and £40,000 in caviar. Of the common sturgeon, the number captured amounts to 300,000, yielding in isinglass £6,500, and in caviar £10,000.

Late in the autumn, and during the winter, a second fishery of the great sturgeon is carried on. Large holes are cut in the ice, for the introduction of the apparatus of lines and hooks, and the fish, when caught, are sent off direct, in a frozen state, to Astracan, by means of sledges.

It has been calculated that the spring and winter fisheries of the great sturgeon produce, annually, 103,500 fish, which afford 30,000 pounds of isinglass, and 414,000 pounds of caviar.

The common sturgeon of our seas sometimes attains to an enormous size; one recorded by Pennant, which was caught in the Esk, weighed 460 pounds; and in 1802, a specimen, eight feet long, was caught in a weir below the castle of Shrewsbury, and weighed 190 pounds. The mouth of the sturgeon is destitute of teeth, and it is said to feed principally on molluscs, and various soft substances it may find at the bottom of the water. The under side of the snout is garnished with four barbules or feelers.

THE LARGE SPOTTED DOG-FISH.

Various specimens of the Shark tribe* are constant tenants of our seas, and other species are either accidental or regular visitors to our coasts. Some species of this ferocious group produce their young alive; others produce eggs, if they may be so called, or rather horny cases, of an oblong figure and compressed, in which the young fish is inclosed. These cases, when empty, are thrown very commonly on our shores; from each angle long curling appendages or filaments project, at least in the eggs of most, as, for example, the small spotted dog-fish. They are known as sea-purses, mermaids' purses, &c. By means of these filaments, or tendrils, they become attached to sea-weeds; and a small linear fissure, near each end, allows the admission of water to the inclosed fish, which ultimately escapes by an aperture at one end, which is closed till the fish opens it. We shall notice some of these creatures.

THE DOG-FISH.

Of this fish there are several kinds. The Large Spotted Dog-fish † has been found on the Dorsetshire and Devonshire coast, and also in Scotland. The Small Spotted Dog-fish ‡ is one of the most common species on our shores, particularly along the southern coast. The Black-mouthed, or Eyed Dog-fish § is met with in Cornwall, the North of Ireland, and also in the Mediterranean. The Picked Dog-fish || is found in numbers at most of the fishing-stations along the south-eastern coast round to Kent and Sussex, where it is generally called the "Bone Dog." It may be distinguished from others by the single spine placed in advance of its two dorsal fins—a weapon which has poisonous properties, and from which it derives its specific appellation; pick being synonymous with pike, or spike. The dog-fishes usually

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* Squalidæ.

† Scyllium catulus.

‡ S. canicula.

§ Squalus annulatus.

|| Acanthias vulgaris.

swim low in the water, and hunt for prey in troops, feeding on fishes and crab-like creatures. Their voracity and their numbers render them very troublesome to the fishermen, for though they are only about two feet in length, they drive shoals of larger and more valuable kinds from their haunts; and are, besides, often caught on lines intended for a different capture. These fish are taken from boats or vessels with hand lines, and a herring or part of any fish as bait.

THE WHITE SHARK.*

THIS ferocious creature is, happily, not a frequent visitor to our coasts, nor does it long continue when it makes its appearance. It is found more frequently in the Mediterranean, especially in the spring and autumn.

Fatal as the White Shark is to the unarmed, those who carry weapons of defence very frequently cope with and master him; even women, undaunted by their teeth, have been known to stab and destroy them in their bath. One day, a little boy about eight years old, happened to be washed from a catamaran which was managed by his father, who was thus early initiating him into the hardships of the mode of life which he intended him to pursue; and before he could be rescued from the turbulent waters, a shark drew him under, and he was seen no more.

THE BLUE SHARK.

The father lost not a moment, but calmly rose, and placing between his teeth a large knife which he carried sheathed in his summer-band, plunged beneath the lashing waves. He disappeared for some time, but after awhile was occasionally seen to rise, and then dive under the billows, as if actually engaged with his formidable foe. After awhile the white foam was visibly tinged with blood, which was viewed with a sensation of horror by those who could only surmise what was going on under the water. The man was again seen to rise and disappear, so that the work of death was evidently not yet complete; after some further time had elapsed, to the astonishment of all who were assembled on the beach—for a considerable crowd had now collected—the body of a huge shark was seen for a few moments above the white spray, which it completely crimsoned, and then disappeared.

An instant after, the man rose above the surf and made for the shore. He seemed nearly exhausted, but had not a single mark on his body, which bore no evidence whatever of the perilous conflict in which he had been so recently engaged. He had scarcely landed, when an immense shark was cast upon the beach by the billows. It was quite dead, and was immediately dragged by the assembled natives beyond the reach of the surf. As soon as the shark was drawn to a place of security, it was opened, when the head and limbs of the boy were taken from his stomach. The body was completely dismembered, and the head severed from it, but none of the parts were mutilated.

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* Carcharias vulgaris.

THE BLUE SHARK.*

THIS species is remarkable for the slenderness of its body; it inhabits the Mediterranean, and periodically visits the Cornish coast, to the great injury of the fishermen. Mr. Yarrell quotes the following details, given by Mr. Couch:—"The blue shark is migratory, and I have never known it to arrive on the coast of Cornwall before the middle of June; but afterwards it becomes so abundant, that I have known eleven taken in one boat, and nine in another, in one day. The injury they inflict on the fishermen is great, as they hover about the boats, watch the lines, which they sometimes cut asunder, without any obvious motive, and pursue the fish that are drawn up. This, indeed, often leads to their own destruction; but when their teeth do not deliver them from their difficulty, they have a singular method of proceeding, which is, by rolling the body round, so as to twist the line about them throughout its whole length, and sometimes this is done in such a complicated manner, that I have known a fisherman give up any attempt to unroll it as a hopeless task. To the pilchard drift-net the shark is a still more dangerous enemy, and it is common for it to pass in succession along the whole length of the net, cutting out, as with shears, the fish and the net that holds them, and swallowing both together."

THE HAMMER-HEADED SHARK.

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* Carcharias glaucus.

THE GREENLAND SHARK.*

This creature is well known to the Greenland fishers as the deadly foe of the whale. It is extremely tenacious of life, and its ferocity is dreadful. It attacks the whale, rending out with every snap large masses of its flesh ; while the latter lashes the water with agony or vain efforts to drive away his foe. The Hammer-headed Shark,† so called from the extraordinary structure of its anterior portion, and the Porbeagle Shark‡ are other examples of their kind.

A singular circumstance may here be mentioned connected with the sharks of the temperate and warmer latitudes—as the White Shark and the Blue Shark—as they are often seen with two or more small attendants, called Pilot Fishes,§ between which and themselves a singular friendship subsists. They have been known to interpose between their friend and the baited hook, and running against his muzzle, turn him from it. On the other hand, perhaps, when they see no danger, they will direct him to the bait, and even cling to him as he is hoisted up on deck. This singular fish will also attend on vessels during their course, and that for months together ; a fact known to the ancients, who held it sacred as a pilot to the doubtful navigator. This fish much resembles a mackerel, and is tranversely banded. It belongs, like the Sword-fish, to the Mackerel family.

SHARK ATTACKING A BOATMAN IN THE SEA OF JAPAN.

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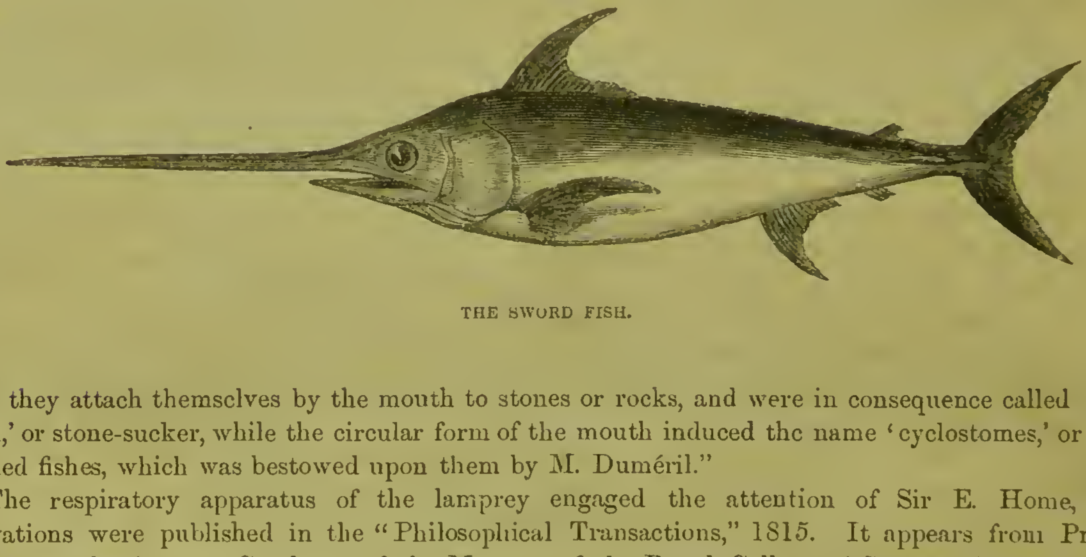
* Scymnus borealis. † Squalus zygæna. ‡ Lamna cornubia. § Naucrates ductor.

THE SWORD FISH.*

This remarkable creature is an inhabitant of the Mediterranean and Atlantic, occasionally visiting our coast. It measures from ten to fifteen feet in length, of which the sword forms three-tenths. Its body is lengthy, and covered with minute scales, and on its back is a single long, elevated dorsal fin. The lower jaw is sharp, the mouth without teeth. The upper part of the fish is bluish black, merging into silver below. The young fish is said to be good eating. When very young, the body is covered with small tubercles, which disappear before it attains the length of three feet.

The Xiphias is mentioned by Aristotle, who notices the fact of its striking vessels. The Sword Fish, as we call it, is said to attack the whale, wounding it with its beak. There are many well-authenticated instances of the planks of ships being perforated by this powerful creature, which, it has been supposed, occasionally attacks the hulls of ships in mistake for the whale. Specimens of ships' timbers penetrated by its sword are preserved in many museums.

Another large family† now claims notice, and particularly one genus,‡ containing the Lampreys. "The lampreys, like the sharks and rays," says Mr. Yarrell, "have no swimming bladder, and, being also without pectoral fins, are usually seen near the bottom. To save themselves from the constant muscular exertion which is necessary to prevent them from being carried along with the current of the water, they attach themselves by the mouth to stones or rocks, and were in consequence called 'petromyzon,' or stone-sucker, while the circular form of the mouth induced the name 'cyclostomes,' or round-mouthed fishes, which was bestowed upon them by M. Duméril."



THE SWORD FISH.

The respiratory apparatus of the lamprey engaged the attention of Sir E. Home, whose observations were published in the "Philosophical Transactions," 1815. It appears from Professor Owen's remarks, in the "Catalogue of the Museum of the Royal College of Surgeons," that when the lamprey clings to a stone by means of its sucking mouth, the water is received through the orifices on one side, traverses the internal apparatus, and is discharged from the orifices on the opposite side; a regular succession of currents being maintained. The hinder caudal portion of the body only is furnished with a continuous fin above and below.

THE SEA LAMPREY.§

This fish is widely dispersed in the seas of Europe and America. Its colour is olive-brown, marbled with a dark green and dusky brown. It exists in the Mediterranean, as well as in the colder climates, and is everywhere migratory in its habits; ascending the rivers in the spring or summer, according to the advance of the warmer season in those countries. Formerly great numbers worked their way up the Thames to a considerable distance, in order to deposit their roe, but few are now taken. In the Severn there is a periodical influx of these fishes in considerable numbers, during the months of April and May, and also in various rivers which open into the sea along our southern coast.

* Xiphias gladius. † Petromyzidæ. ‡ Petromyzon. § Petromyzon marinus.

"In Scotland," says Sir W. Jardine, "they ascend our rivers to breed till about the end of June, and remain until the beginning of August. They are not furnished with any elongation of the jaw, afforded to most of our fresh-water fishes, to form the receiving furrows at this important season; but the want is supplied by their sucker-like mouth, by which they individually remove each stone. Their power is immense; stones of very large size are transported, and a large furrow is soon formed. The sea lampreys remain in pairs, two on each spawning-place, and while there employed, retain themselves affixed by the mouth to a large stone."

The progressive motion of the Lamprey in the water is undulatory, like that of an eel, but from time to time it seeks to moor itself to any fixed object that offers, and then darts again onwards. Soft animal substances, and even fish, constitute its nutriment. It fixes on its prey like a leech, and rasps away with its hard teeth till it deeply penetrates. When full grown, this species attains to the length of twenty-five or twenty-six inches.

The lamprey has from early times been regarded as a delicacy for the table. The potted lampreys of Worcester are celebrated. Henry I., surnamed the Beauclerk, Rapin says, was exceedingly regular in his diet, and "never known to be guilty of any excess in eating or drinking." So far his practice appears to have inculcated

> "The rule of 'not too much,' by temperance taught,
> In what thou eat'st and drink'st, seeking from thence
> Due nourishment, not gluttonous delight."

There seems, however, to have been one sad exception to his rule: it is stated that an illness, brought on by immoderately eating lampreys, of which he was very fond, terminated fatally.

THE RIVER LAMPREY.*

A SMALLER species, of a bluish colour above, passing into white beneath, is a permanent resident in many of our rivers, and those of Scotland and Ireland. It is about twelve or fourteen inches long, of a bluish colour above, passing into white beneath. Formerly, this fish was taken in enormous quantities in the Thames, as many as one million or twelve hundred thousand being captured in a single year. Numbers were sold to the Dutch fishermen as bait. Mr. Yarrell says that 400,000 have been sold in a single season, at the rate of forty shillings per thousand. At present the lamprey is far less plentiful in the Thames than formerly. In the Severn, the Dee, and the Mersey, as well as other rivers, it still abounds.

This species breeds in May, and is in the best condition from October to March, during which period only its fishing is permitted. Cuvier states that it is common in the waters of the Continent. Like the sea lamprey, it is in repute as a delicacy. The river species, it should be observed, is sometimes called the lampern.

A distinct species, called the Fringe-lipped Lampern, is occasionally to be met with in our rivers, and more frequently in those of the Continent. It is as thick, but shorter than the preceding species, and has its sucking lip peculiarly broad and fringed.

In the Thames and various other rivers, and in the streams of the Continent, is found a species of lamprey, of a very small size, being only five or six inches long, and as thick as a goose-quill. It is called the Pride, or Sand-Pride, or Mud-Lamprey, and in French, *Lamprillon*, *Civelle*, and *Chatonille.* Its lip is not circular, but presents the form of a horse-shoe, and does not appear to act as a sucker; its mouth is destitute of true teeth.

THE SKATE, OR RAY.

MANY kinds of Skates, or Rays,† are natives of our coasts. They are distinguished from other fishes by the wing-like expansion of their side fins, their long and spiny tails, their peaked snout, the position of the eyes on the top of the head, and of the mouth, nostrils, and gills—orifices on the under surface. In the skates, or rays, the internal surface of the upper and lower jaws are covered with a close array of teeth, which has been compared to a tesselated pavement. In some species these teeth are flat and rounded, to act like crushers; in others, they are sharp and conical; and, strange to say, the males of some species have the teeth sharp, the females rounded or flat, and the young of both sexes flat teeth.

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* Petromyzon fluviatilis.

† Raiidæ.

The skates, or rays, produce their young in horny cases, much resembling those of the dog-fish, but broader in proportion, and with thicker and shorter filaments. They breed in spring and summer, and are consequently in the best condition during the winter, and the flaky flesh of various parts is then very delicate.

The Blue or Grey Skate,[*] often called the True Skate, is common on our coasts. A large species, the Long-nosed Skate,[†] is frequently met with, and is at once distinguishable by its long, slender, tapering snout. A species, termed the Sharp-nosed Ray, or White Skate,[‡] is taken in abundance, and great numbers are sold at Plymouth to the French fishermen, for their markets during Lent, it being highly esteemed as an article of food. Another, having the upper surface variously spotted, called the Homelyn or Spotted Ray, is also common, and is to be seen in considerable abundance in the London markets. Few fish are more voracious than these tenants of the muddy or sandy bed of the sea; they feed on crab-like creatures and shell-fish, crushing them with ease; their movements are undulatory or sliding, and performed by flappings, more or less violent, of their wing-like fins, the long, slender tail being lashed from side to side.

THE LONG-NOSED SKATE.

THE SPOTTED RAY.

The Thornback,[§] it should be observed, is one of the most frequent species in our seas, and is taken in great numbers for the markets, where the female is sold as the Maid. This species, like the rays in general, is in perfection in winter, but is chiefly taken during the spring, when it leaves the deep sea for the shallow parts, in order to deposit its roe. Its fins are very ample, and the upper surface is studded with recurved conical spines. In taking the rays, lines are employed; sand-worm, shell-fish, or any glittering fish, cut up, will serve as bait.

Among the rays is found a remarkable family of fishes.[||] Of these we take one.

THE TORPEDO.[¶]

This, with other species, is found on most of the coasts of the Atlantic and Mediterranean, and sometimes so abundantly as to become a staple article of food. Its electric phenomena have been long known, and were noticed by writers of antiquity. Its organs were examined by the celebrated John

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[*] Raia batis.
[†] R. chagrinea.
[‡] R. oxyrynchus.
[§] Raia clavata.
[||] Torpedinidæ. Sub-order, Raiinæ.
[¶] Raia torpedo.

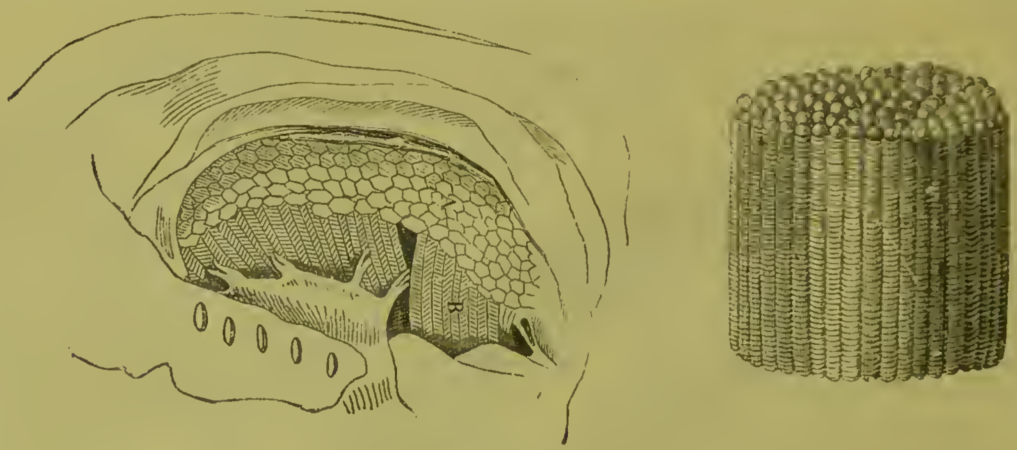
Hunter, who counted more than a thousand in one organ of five or six-sided prisms (B), with their bases presented to one surface of the fish, and their apices to the other. These are divided horizontally by numerous septa; the interspaces being filled up with a gelatinous fluid. An immense quantity of nerves pervade these prisms, on the integrity of which the power of communicating the shock depends; for their division is fatal to it. The electricity of the back is positive, and of the under surface negative; and in order to feel the shock a circuit must be made between them. Sir Humphrey Davy succeeded in his experiments on this curious fish, even to heating platina wire, decomposing acidulated water and iodide of potassium, besides actually magnetising needles in a helix.

THE TORPEDO.

The electric organs of the *Gymnotus*, already mentioned, are essentially the same in structure as those of the Torpedo, though differing in shape, in accordance with the conformation of the animal. They occupy one-third of its whole bulk, and run along nearly its entire length; there are, however, two distinct pairs, one much larger than the other. The prisms are here less numerous, but are much longer, for they run in the direction of the length of the body, a difference which is productive of a considerable modification of the character of the discharge.

Even slices of an electric organ, entirely separated from the body, except by a nervous fibre, may exhibit electrical properties. Discharges may be excited by irritation of the brain when the nerves are entire, or of the part of the divided trunk distributed on the organ; but on destroying the electric lobe of the brain, the electric power of the brain ceases entirely. It is remarkable, however, that after the section of the electric nerves, torpedoes appear more lively than before the operation, and actually live longer than others which are excited to discharge frequently.

The uses of these electric organs it is somewhat difficult to explain. A friend of the writer's saw a small fish, provided for the food of a *gymnotus*, receive a shock, on passing under the body, which killed it instantly, after which it was devoured by the eel. But these creatures, like the torpedoes, eat very few of the fishes which they kill. Dr. Carpenter suggests that this peculiar action may assist the digestion of the fish, as animals killed by electricity are more digestible. The electrical condition of the animal itself, he also thinks, may conduce to the easy digestion of its food.



ELECTRIC ORGANS OF THE TORPEDO.

THE MYXINE.*

This fish Linnæus regarded as belonging to the class *Vermes;* while Modeer placed it among the *Amphibia*. It is, however, one of the lowest in structural organisation among the fishes. It is shaped like an eel, and measures, when full grown, about one foot and a half.

The Myxine is a deadly foe to fish, into the bodies of which it enters, and eats up all the fleshy parts, leaving all the skin and bones. Nillson says that several have been found in the body of a single haddock, which was all eaten away internally. The cod-fishers of Scarborough and Berwick often capture this fish in the bodies of cod or haddock drawn up by their lines, and some believe it enters their mouths while they are held and drawn up by the hook.

But Cuvier says it attacks and pierces the fish: aided, perhaps, by the sense of touch implanted in its feelers, it may have the power of suddenly fixing itself by means of its hooked palatal teeth, and then, boring and rasping with its lingual teeth, insinuates itself beneath the skin, and gradually works its way into the very body of the victim. On some parts of our eastern coast it is therefore called "the borer."

This fish is of a dark bluish-brown colour above, and whitish beneath. It is not uncommon in the Scandinavian seas, and is frequently taken upon the north-east coast of Britain. It does not stand alone, but is one of a genus of cartilaginous fishes, of the order *Cyclostomi*.

We are unable to give more space to the consideration of Fish, of which several thousand specimens may be seen in the museums of Europe, every one of which has been adapted in form by the Creator to the gravity of its watery abode—whether the river or the lake, the marsh or the sea. If all fishes had been of one weight, one effort of contrivance would have enabled them all to swim; but every species of fish, almost every individual of each species, differs in its weight and size from every other.

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* Gastrobranchus cæcus. Myxine glutinosa.

INSECTS.

Expressly designed for progression through the air, Insects compose the most extensive class of the whole Animal Kingdom. On them has been lavished the choicest gifts of physical powers, so far as they are compatible with structures so minute. The model on which they are formed, so to speak, is that which combines the greatest security against injurious impressions from without, with the most extensive powers of locomotion, and which also admits of the fullest exercise of all those faculties of active enjoyment which characterise animal life. Thus, this part of animated Nature, like every other, is eminently calculated to direct the mind to the Great Creator. "If," says the ancient writer Basil, "you speak of a fly, a gnat, or a bee, your conversation will be a sort of demonstration of His power whose hand formed them; for the wisdom of the workman is commonly perceived in that which is of little size. He who has stretched out the heavens, and dug up the bottom of the sea, is also He who has pierced a passage through the sting of the bee for the ejection of its poison." Nowhere, indeed, are we so called, as in the contemplation of insects—

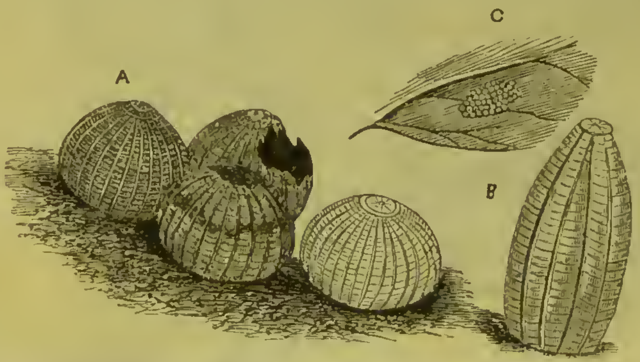
> "To trace in Nature's most minute design
> The signature and stamp of power divine;
> Contrivance intricate express'd with ease,
> Where unassisted sight no beauty sees;
> The shapely limb, and lubricated joint,
> Within the small dimensions of a point;
> Muscle and nerve miraculously spun;
> His mighty work who speaks, and it is done!"

True insects may be generally defined:—Articulated animals possessing six legs, two antennæ, two compound eyes, a small brain at the anterior extremity of a double medullary chord; circulation effected by a pulsating dorsal vessel, provided with numerous valves; respiration by tracheæ, which form two lateral trunks, and ramify through the body; and two distinct sexes.

The final accomplishment of objects so numerous, so widely different, and so liable to mutual interference, is attained by each insect being subjected to a series of modifications, and passing through several intermediate stages of development. The power of flight, for instance, is never conferred on an insect in the earlier periods of its existence; but its structure obtains the lightness which fits it for rising in the air, and it acquires the instruments capable of acting on it, by going through several preparatory changes, some of which are so considerable as to justify the term of *metamorphoses*, which has generally been given them. So peculiar, however, are the circumstances of the *egg* state, the *caterpillar* state, the *pupa* state, and the *imago*, or perfect state, of insects, that we shall consider them separately.

THE METAMORPHOSES OF INSECTS.

It has been noticed as a singular fact that the female sheep, weeks before yeaning, selects some sheltered spot where she may drop her lamb with the most comfort and security; but the provision made by insects for their future young is far more remarkable. Other creatures attend to their progeny in the early stages of their being, but these, with few exceptions, do not live to see their descendants. There are insects which extrude many eggs at a time, sometimes with great rapidity; while in the case of those which usually deposit their eggs singly, an interval of some minutes, hours, or perhaps even days, intervenes between the extrusion of each egg. A common moth, vulgarly called the ghost, is a singular instance of the former mode. She lays a large number of minute black eggs, resembling grains of gunpowder, and ejects them so fast that they may be said to run from the oviduct, and are sometimes expelled with the force of a pop-gun. Another insect is said to discharge her eggs like shot from a gun. And a gentleman who had observed with attention the proceedings of a common crane-fly, assured Mr. Kirby that several which he caught projected their eggs to a distance of more than ten inches. In every instance, doubtless, the mode of extrusion accords with the structure and instincts of the parent insect, while, as certainly, the egg is deposited where the caterpillar, on emerging from it, may be provided with suitable food. We have engraved some specimens of insects' eggs of the natural size and also considerably magnified.



EGGS OF BUTTERFLIES.—A Pieris napi. B Pieris rapæ. C Eggs as deposited.

EGGS OF LACKEY MOTH.

EGGS OF MANGOLD-WURZEL FLY. Abraxas.

Bœtica.

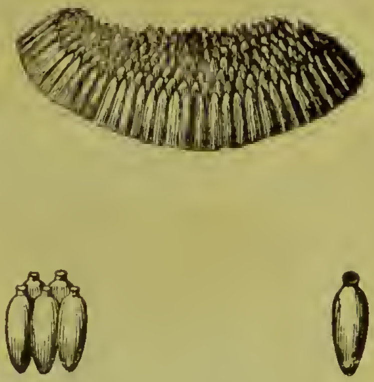
EGG OF BLOW FLY.

EGGS OF MOTHS.—Abraxas Grossulariata. Saturnia carpini. Smerinthus populi. Pencallia syngaria.

As the eggs of lackey moths, which are laid in the autumn are not to be hatched until the spring, the insect does not, like most other moths, place them upon a leaf, with which they might be blown far from their destined food, but upon the twig of some tree, round which she ranges them in numerous circles. With such admirable art is this done, that observing them on your fruit-trees, you would take them rather for pearls, set by the skilful hand of a jeweller, than for the eggs of an insect. Each of these bracelets, as they have been aptly termed, is composed of from two hundred to three hundred pyramidal eggs, with flattened tops, surrounding the twig in a series of from fifteen to seventeen close spiral circles, and having their interstices filled up with a tenacious brown gum, which, while it secures them alike from the wintry blast and the attack of voracious insects, serves as a foil to the white enamel of the eggs which it encompasses. How such an arrangement can be completed by insects, with their tails and feet, it is not easy to conceive. In the hope of ascertaining this, Reaumur made several experiments; but the insects, so far from disclosing the secret of their art, laid their eggs at random, and made no attempt to place them symmetrically.

The egg of the gnat is shaped like an olive, or a powder-flask, and by itself would sink in water; and yet this insect glues from two hundred and fifty to three hundred in an oblong mass, which is pointed and more elevated at each end, so as to resemble in shape a little boat, which will actually swim safe and unhurt until the grubs are hatched. The lower part, on which it always floats, is convex, and the upper is concave; and so buoyant is it, that no agitation of the water, however violent, can sink it. Mr. Kirby says: "To put this to the test, I put half a dozen of these boats upon the surface of a tumbler, half full of water. I then poured upon them a stream of that element, from the mouth of a quart bottle, held a foot above them. Yet, after this treatment, which was so rough as actually to project one of them out of the glass, I found them floating as before on their bottoms, and not a drop of water within their cavity."

THE GNAT AND HER BOAT OF EGGS.



THE BOAT, EGGS, AND EGG OF A GNAT.

The process by which the boat is made is very remarkable. A gnat has six legs; the four fore-legs she rests on a floating leaf, or on the side of a bucket, if she is in water contained in such a vessel; and her body is thus held level with the water, except the last ring of her tail, which is a little raised. She then begins to use her two hind legs, which she crosses in the shape of the letter X, the open part of which, next the tail, serves as a kind of scaffold for the eggs she lays, until the boat is nearly formed. Each egg, when laid, is covered with a sort of glue; the gnat holds the first-laid egg in the crossed legs until the second is placed by its side, and fastened to it; she then glues to these another egg, making a triangle; and this is the beginning of the boat. Thus she goes on, piling egg on egg, always keeping the boat in proper shape by her useful hind-legs; and as it grows in size, she pushes it from her by degrees, still adding to the unfinished end next her body. When it is of the required size and state, she flies away, and leaves it to its fate, floating on the water.

PINCERS AND TAIL OF GOLD-TAILED MOTH.

Some moths employ a very singular covering for their eggs—hair stripped from their own bodies.

This material is plucked by means of a pincer-like ovipositor. One part of these moths has an extraordinary quantity of hair for this express purpose.

It is from the egg that the insect issues, fully provided for its appointed course. When thus hatched, it is called by naturalists *larva;* if it be without feet, it is, in popular language, a worm, or gentle, or maggot; while, if it is furnished with feet, it bears the name of a grub or a caterpillar. Hamlet says, "Your worm is your only emperor for diet;" and his meaning of the word worm is evident from the remainder of the passage—"We fat all creatures else to fat us, and we fat ourselves for maggots."

THE CATERPILLAR.

HAIRY CATERPILLARS.

Many caterpillars, larvæ, or grubs, are quite naked, but a very considerable number are clothed with hair or bristles, and some have their skin beset with spines, or a mixture of spines and hairs. They make nests in a great variety of most extraordinary ways.

It requires sound knowledge to prevent the ravages of caterpillars. Thus, in Germany, the gardeners and country people have been accustomed very industriously to gather large baskets full of a destructive cabbage-moth, and then to bury them. Now, this plan adopted in reference to our common cabbage-caterpillar would succeed; while, in the present instance, it is just as if one should attempt to kill a crab by covering it with water; for many of the insects are full grown, and ready to pass into their next state as they do underground, so that, instead of being destroyed by this manœuvre, they actually appear again in the following year in still greater numbers.

SOCIAL BEETLES.

Many caterpillars have a social, if others enjoy an isolated existence. A traveller in South America says: "After having ascended an eminence for about an hour, we came to the region of oaks and other majestically tall trees, the names of which I could not learn. Suspended from their stately branches were innumerable nests, inclosed, apparently, in white paper bags, in the manner of bunches of grapes in England, to preserve them from birds and flies. I had the curiosity to examine one of them, which I found to contain numberless caterpillars. The texture is so strong that it is not easily torn; and the interior contained a quantity of green leaves, to support the numerous progeny within."

In all the nests of social caterpillars, care is taken to leave apertures for passing out and in. It is remarkable, also, that however far they may ramble from their nest, they never fail to find their way back when a shower of rain, or nightfall, renders shelter necessary. It requires no great shrewdness to discover how they effect this; for, by looking closely at their track, it will be found carpeted with silk—no individual moving an inch without constructing such a pathway, both for the use of his companions and to facilitate his own return. All these social

NEST OF PROCESSIONARY CATERPILLARS, WITH THE GRUB OF A CALASOMA.

caterpillars, therefore, move more or less in processionary order, each following the road which the first chance traveller has marked out with his strip of silk carpeting. Hence they are often called processionary caterpillars.

The insect having lived its appointed time in the caterpillar state, by a series of extraordinary movements, too numerous and various to be here described, becomes a chrysalis. From the swathed appearance of most insects at this time, they do not badly resemble, in miniature, a child trussed up, like a mummy, in swaddling clothes; and hence Linnæus has called it the *pupa* state. In this condition most insects eat no food, are incapable of locomotion, and, if opened, seem filled with a watery fluid, in which no distinct organs can be traced. Externally, however, the shape of the pupæ of different tribes varies considerably, and different names have been applied to them.

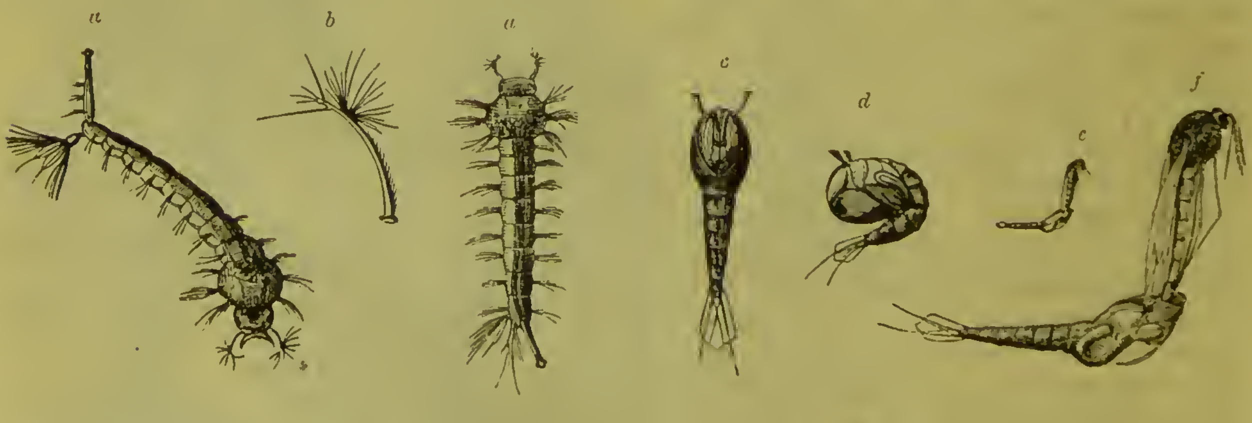
SILKWORM.

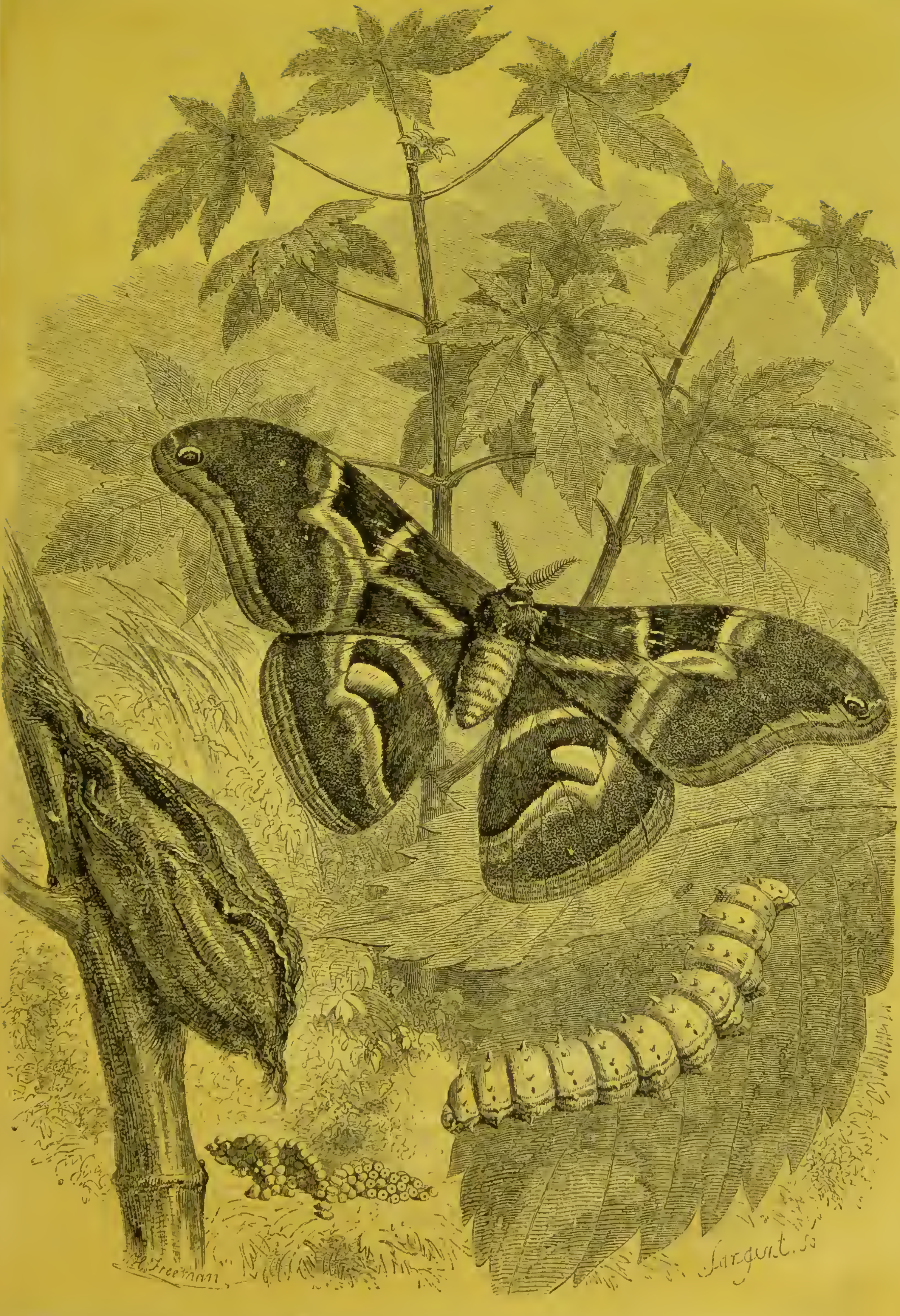
CHRYSALIS OF SILKWORM.

GRUB OF CALASOMA.

At length the insect reaches what Linnæus calls its *imago* state, because, having laid aside the mask, and cast off its swaddling bands, and being no longer disguised or confined, or in any respect imperfect, it is now a true representation or image of its species.

The gnats or musquitoes, which fly in such large swarms, and render themselves so unpleasant to man, live in the water during their larva state. They are then vermiform, destitute of limbs (*a*), and have the abdomen terminated by bristles and some appendages arranged in a radiated form; and from their last ring arises a long tube, by the aid of which the animal draws in from the atmosphere the air which it requires. To breathe by this means, it suspends itself as it were from the surface of the water with its head downwards (*b*); and we see it performing this movement at short intervals. The chrysalis (*c*) continues to live in the water, and to move about there; but, instead of breathing like the larva, it draws in the air which it requires by means of two pipes, placed on the thorax. It now floats on the surface of the liquid (*d*), and, having completed its metamorphosis, the perfect insect uses the skin of the chrysalis as a boat (*e*, *f*), until its long wings and legs have gained sufficient strength to enable it to move on the surface of the water, or to fly away; but should its body happen to be submerged, as often occurs when the wind upsets these frail barks, it is inevitably drowned. On the





THE CATERPILLAR, CHRYSALIS, PERFECT INSECT, AND EGGS OF THE SILK-WORM OF INDIA.

other hand, these efforts are successful in innumerable instances, and the gnats flit about for their appointed time.

It may specially interest some of our readers if we take an instance of these metamorphoses, which they may observe for themselves: it shall be, then, those of the silkworm. It comes from eggs laid by a moth in the autumn of the preceding year. In May the eggs are hatched, and produce small caterpillars, less than the tenth of an inch in length; these increase daily in size, and alter their colour from black till they become nearly white.

GNATS.

In this country the caterpillar takes fifty-six days to arrive at perfection, during which time it invariably sheds its skin as many as four and, occasionally, five times. After every change the caterpillar is lighter in colour, and has a larger head than previous to the change; it spins five or six days, making about sixty-two days.

Goldsmiths or gold wire-drawers have iron plates, pierced with holes of different sizes, and they draw gold and silver wire first through the larger and then through the smaller, according as it is required to be fine. Now, the silkworm has under her mouth just such an instrument, having a pair of holes which are united in one on the outside. This is connected with the part that provides the silk, and which is formed of two long floating twisted tubes, growing slender towards the head of the insect, where they unite to form the spinneret, which renders the silk. The length of these vessels depends on the quantity of silk wanted by the insect; those of the silkworm are about ten inches long, while those of the larva of the goat-moth are little more than three inches.

SILKWORM MOTH.

The silkworm fixes the first drop of gum that issues from these vessels, through the holes just mentioned, where she pleases, and then draws back her head, or lets herself fall, while the gum, continuing to flow, is drawn out and lengthened. On being exposed to the air, it immediately becomes dry, and acquires consistence and strength. And most wonderful is it that she is never deceived in adjusting these openings, or in calculating the proper thickness of the thread, but always makes its strength proportionable to the weight of her body. The thread varies considerably in colour and texture, and sometimes resembles cotton or wool.

In warmer climates, as in India, the caterpillar of the silkworm * arrives at its full growth in forty-seven days, and has finished spinning in five more, making together fifty-two days.

When the caterpillar is about to change its skin, it ceases to eat, holds its head up stiff, and appears ill and sulky; the new head is plainly to be discovered through the transparent skin behind the old one, and is rather of a triangular shape, the apex of the triangle being uppermost. After remaining in this state two or three days, the skin opens behind the head, which cracks longitudinally, and is cast with the skin; the caterpillar then twists itself from side to side, and writhes about, while the skin gradually slips from its body, and comes off at the tail.

The period of a silkworm being ready to spin is plainly indicated by its ceasing to eat, and becoming suddenly more transparent and of a yellow colour; it will also begin to spin a few threads of silk among the leaves, or in the corner of the tray in which it lies. Thus a regular oval ball of silk is spun, which is suspended in the centre of the cell, and in the interior of which the insect continues to work for five days; after being ten days there, its cocoon will be compact and complete. "When," says

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* Bombyx cynthia.

Bonnet, "I see an insect working at the construction of a nest or a cocoon, I am impressed with respect, because it seems to me that I am at a spectacle where the Supreme Artist is hid behind the curtain."

Within the cocoon is the chrysalis, and in a fortnight or three weeks after the winding of the silk, some of the chrysalides will be found cracking and opening, and the perfect moths will then appear. These are small, sluggish creatures, of a pale buff colour, seldom leaving the tray, mat, or paper on which they are placed, and on which the females lay their eggs.

Thomson says of the escape from the chrysalis :—

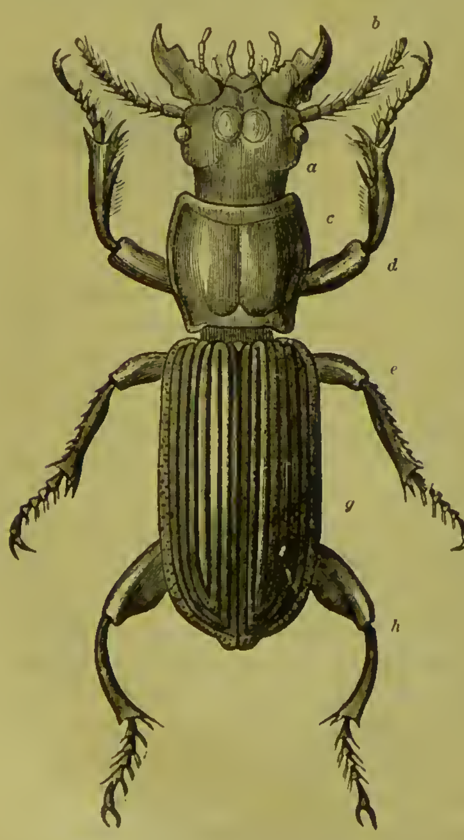
> "Behold, ye pilgrims of this earth, behold !
> See all, but man, with unearned pleasure gay ;
> See her bright robes the butterfly unfold,
> Broke from her wintry tomb in time of May.
> What youthful bride can equal her array ?
> Who can with her for easy pleasure vie?
> From mead to mead, with gentle wing to stray,
> From flower to flower on balmy gales to fly,
> Is all she hath to do beneath the radiant sky."

But not merely do these insects "stray from mead to mead ;" they flit in the flower-garden from blossom to blossom ; they dart forth as we rustle through the mountain heather ; they glance through the bright and sunny glades of the forest, or are motionless as the lichens which variegate the trunks of its wide-spreading trees ; and will even invite some hand to secure them as they frolic among the furniture of a room.

Having thus considered the metamorphoses of insects, it is necessary now to examine their general structure.

THE STRUCTURE OF INSECTS.

The term "insect," it should be observed, is often applied not only to the grasshopper, the fly, and the beetle, but to other small animals, such as slugs and worms. If, however, one of the former be examined, its body will appear insected, being divided, as it were, into three principal pieces ; the head, the trunk, and the abdomen ; and it is only where such a division is more or less obvious that this name can properly be given. A recollection that the English word is probably a corruption or contraction of a Latin term, that signifies "cut between," will effectually guard against mistake.



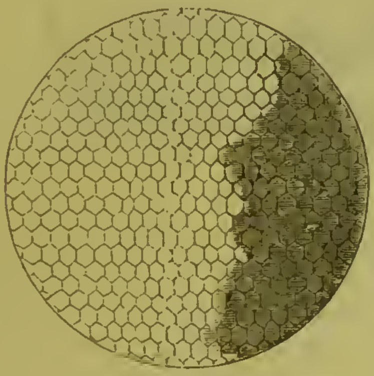
a, the head, with its palpi and two eyes, and *b*, its antennæ ; *c*, *d*, the thorax, with the pro-legs and the middle legs, *e f* ; *g*, the abdomen ; *h*, the hind legs.

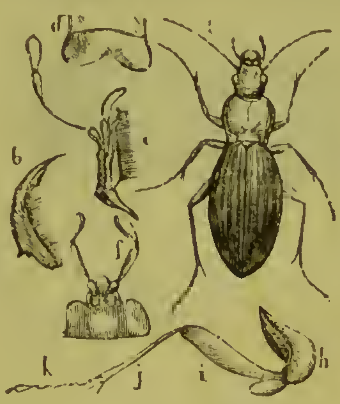
We begin with the consideration of their *external* structure ; and here the head, the thorax, and the abdomen are at once distinguishable ; the term thorax being applied to all that part of an insect which lies between the head and the abdomen, and to which the legs and wings are attached. The thorax is comprised of three segments ; and in some instances each is possessed of a pair of legs. The abdomen is often furnished with appendages at its extremity ; thus, in the earwig, in which Mr. Westwood discovered more than the usual number of segments, there is a pair of forceps which serve as weapons of defence ; and in the male sex of *panorpa*, where the apex of the abdomen is considerably elongated, there is also a pair of forceps. The appendages, however, are greatly diversified.

The eyes of insects include a world of wonders. Unlike those of vertebrate animals, they are incapable of motion ; and hence abundant provision is discoverable to prevent inconvenience or injury from this arrangement.

Some eyes are simple, varying from two to sixteen. Others are called conglomerate, because they are collected into a body ; thus in the common millepede there are twenty-eight, placed in seven rows, and forming a triangle, having seven at the bottom and one at the top. Others are called compound, and when under a microscope seem to consist of an infinite number of hexagonal or six-sided pieces. The eyes of many horse-flies have vivid bands of purple and green; others are spotted, and one has the figure of a flower painted in red on a black ground. These colours and markings are all most vivid and brilliant in the living insect.

The situation and arrangement of simple eyes are various. In many they are imbedded, as usual, in the head; but in a little scarlet mite, they stand on a small foot-stalk—and why? Because otherwise the hairiness of this creature might have impeded its sight. In the *phalangidæ*, the frontal eyes of the scorpion cease, and only a pair of dorsal ones are inserted vertically in the sides of a horn or tubercle, often itself standing upon an elevation, which emerges from the back of the animal. And here is another admirable provision; for if the eyes of these insects were not in a vertical and elevated position, their sight would be very limited; but by means of this structure they get a considerable range of surrounding objects, as well as of those above them. Sometimes the eyes are placed nearly in the segment of a circle; sometimes in two straight lines; at others in three lines, and at others in four. Again, in some instances they form a cross, or two triangles; in others, two squares; in others, a smaller square included in a large one; in others, a posterior square and two anterior triangles; sometimes a square and two lines. Though generally separate from each other, in several cases two of the eyes touch; and in one instance three coalesce into a triangle.


THE EYE OF A HOUSE-FLY.



PARTS OF THE MOUTH OF A BEETLE.—*d*, Labrum; *b*, *c*, Mandibles, with an antenna; *f*, Labium, with Labial palpi; *h*, *i*, leg; *j*, tibia; *k*, tarsus.

The substance of the upper jaws of insects is hard, horny, and of considerable strength; and their structure is admirably adapted for their intended services: some armed with spines and branches for tearing flesh; others hooked for seizing, and at the same time hollow for suction; some calculated, like shears, for gnawing leaves; and others more resembling grindstones, able to reduce the hardest wood. The major part of eating insects have, indeed, an under pair of jaws, both placed horizontally; the former in order to seize and masticate the prey; the latter, when hooked, for retaining and tearing, while the upper reduce it to powder before it is swallowed.

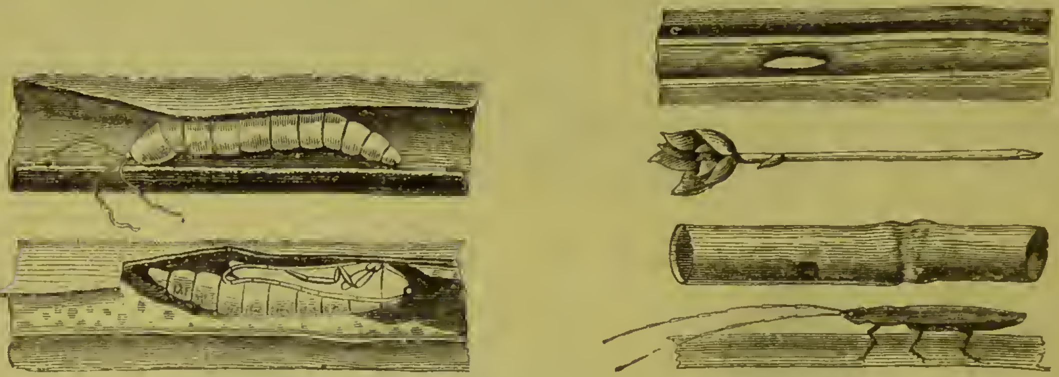
To some insects the mandibles, or upper jaws, supply the place of trowels, spades, and pickaxes; to others that of saws, scissors, and knives, and, indeed, divers instruments. In the beetle the upper jaws are soft and membranous. Generally, they are armed with teeth, and the teeth are divided into incisors—laniary and molary; they are not, however, fixed into the mandibles, but form an actual part of those organs.

FOOT OF FLY.

The mandibles of caterpillars do not act perpendicularly, like the jaws of quadrupeds, but horizontally, and are moved by powerful muscles. Ordinarily, they are slightly bent in the form of a reaping-hook, having the concavity indented with the tooth-shaped projections, formed out of the substance of the jaw, and not socketed, as the teeth of quadrupeds. These are made to meet like the blades of a pair of pincers; and in some cases they both chop and grind the food. Besides these, there is a pair of jaws, placed on each side of the middle portion of the under lip—the maxillæ; and from their being of a softer substance, they seem to be more for the purpose of retaining the food than for mastication.

In the process of transformation a corresponding change takes place in the internal structure of the organs of digestion; and the formidable apparatus for masticating, just described, is well adapted to supply the capacious stomachs of caterpillars. An insect in this state will actually devour in a month sixty thousand times its own weight of leaves. But in every instance the jaws are exactly adapted to their appointed service.

The jet-ant, for example, works always in the interior of trees; and on one side may be found horizontal galleries, which follow the circular direction of the layers of the wood; and on another, parallel galleries, separated by extremely thin partitions, having no communication except by a few oval openings. Within the galleries several chambers are formed. Pillars, too, appear, originally arched at both ends, and then worked into regular columns. Colonnades sustain the upper stories, and leave a free communication throughout the whole extent. The celebrated Huber, who observed these things, says—"I have seen fragments of from eight to ten inches in length, and of equal height, formed of wood as thin as paper, containing a number of apartments, and presenting the most singular appearance. At the entrance of these apartments, worked out with so much care, are very considerable openings; but in place of chambers and extensive galleries, the layers of wood are hewn in arcades, allowing the ants a free passage in every direction. These may be regarded as the gates or vestibules, conducting to the several lodges." Yet all this strange architecture is wrought out by the insect's jaws.

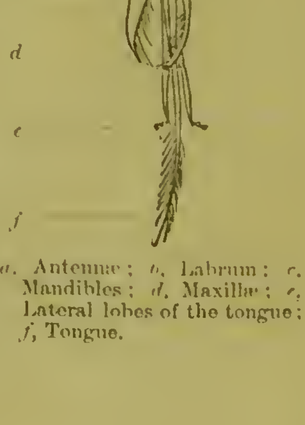


RAVAGES OF CATERPILLARS.

The tongue of insects lies between the two lips, the labrum and labium. On its upper side, at the base, it meets the palate or roof of the mouth, below which it is attached, it may be presumed, by its roots, to the crust of the head, on each side the pharynx or swallow; and on its lower side, in many cases, it is attached to the labium, and that very closely, so as to appear to be merely a part of it, and to form its extremity; but in others it is more free, and in form somewhat resembling the tongue of quadrupeds. "When ants are disposed to drink," says M. P. Huber, "there comes out from between their lower jaws, which are much shorter than the upper, a minute, conical, fleshy, yellowish process, which performs the office of a tongue, being pushed out and drawn in alternately: it appears to proceed from the lower lip. This lip has the power of moving itself forwards in conjunction with the lower jaws; and when the insect wishes to lap, all this apparatus moves forward; so that the tongue, which is very short, does not require to lengthen itself much to reach the liquid." What a curious structure to meet the necessities and comfort of these little creatures!

Underneath the mandibles are the maxillæ. Occasionally they are employed in lacerating the food; but their primary use seems to be to hold and preserve it from falling, while the mandibles are employed in its laceration.

The palpi take their name from the peculiar part of the mouth to which they are attached, thus: when they spring from the maxillæ, they are termed maxillary palpi; when they are attached to the



a. Antennæ; b. Labrum; c. Mandibles; d. Maxillæ; e. Lateral lobes of the tongue; f, Tongue.

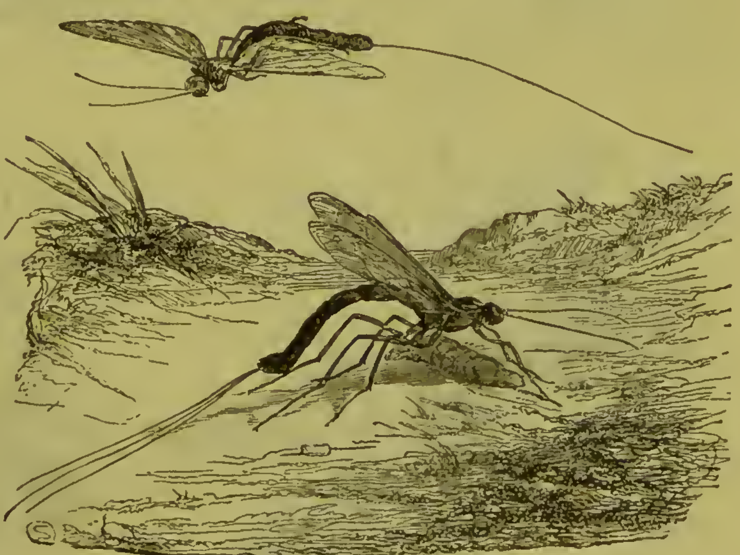
lower lip, they are called labial palpi. They are generally believed to be what their name denotes, "feelers."

Of all the organs of insects, none seem more important to them than the antennæ, or horns; and none are certainly more wonderful or various in their structure. No insect has more than two, which are inserted in the crust of the head, together with an appropriate series of muscles and nerves. As it is necessary they should be under the direction of the eyes, they are always situated in the space between them or in that below them. They vary in length, being sometimes short, and in one case more than four times as long as the body. They consist in general of a number of tubular joints, each having a separate motion, which enables the animal to give them every flexure necessary for its purposes. They are either generally or partially covered with down or hairs; and in some aquatic beetles they have a part which, like the lid of a box, shuts them in when unemployed, and protects them from the water.

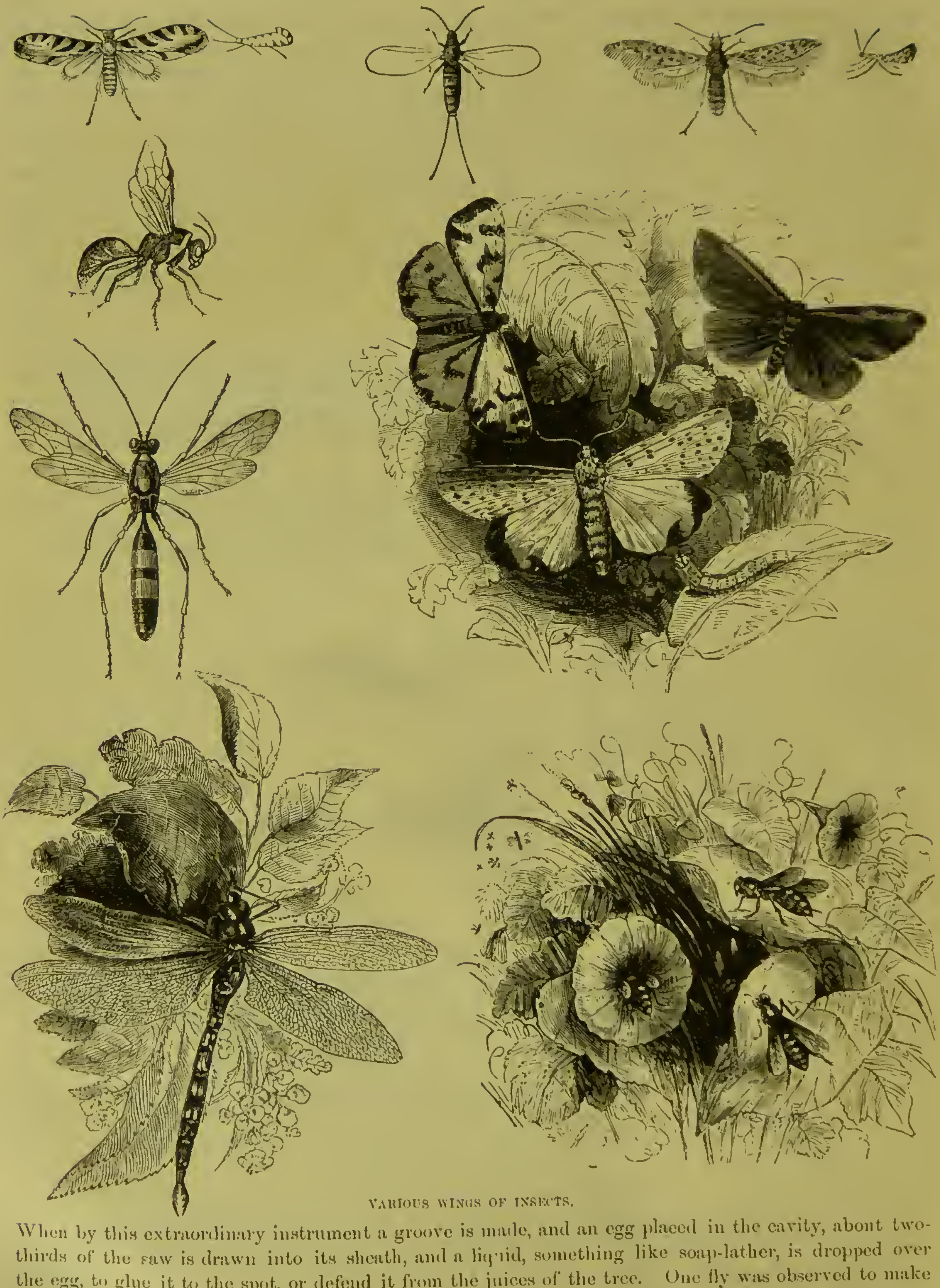
The great majority of antennæ are employed by insects as tactors, to explore their way. When some of them, and more particularly the *coleopterous*, or wing-sheathed, are about to move from any place of rest, they first, and before they take a step, expand their antennæ—which have either been carefully laid up in a cavity fitted to receive them, or back upon the body—probably to ascertain the state of the atmosphere. As the animal begins to move, they in many cases do the same, and continue their action till it stops and returns to a state of repose. In some tribes the vibration is almost constant; others, when one horn is raised, depress the other, as if, by those means, they balanced themselves.

The grubs, which often strip rose, gooseberry, raspberry, and red-currant trees of their leaves, and invade the birch, alder, and willow, may be known by having from sixteen to twenty-eight feet, by which they usually hang to the leaf they feed on, while the hinder part of the body is coiled up like a watch-spring. Some of the most common of the perfect flies have a flat body, of a yellow or orange colour, while the head and shoulders are black.

Most insects have an instrument called an ovipositor, by which they lay their eggs in proper places, and where the grub may find food as soon as it is born. This is one of the most remarkable gifts which God has bestowed on these little creatures, both as to its structure and its operation. Sometimes it has one part inside another, like the pieces of a telescope; at others it is cylindrical, ending in a pair of joints, which seem to act as forceps or pincers, including a tube (probably to convey the egg, that the pincers may introduce it); and at others bent like a sabre. A most singular ovipositor in the body of a little four-winged creature has obtained for it the name of the saw-fly.


OVIPOSITOR OF ICHNEUMONS.

The saw-flies have, in a sheath, a saw, of a horny substance, with which they penetrate the branches and other parts of plants, in order to deposit their eggs. In some respects it is like, and in others unlike, the cabinet-maker's tenon-saw, which is made of a thin plate of steel, fitted into an iron back. The insect's saw has a back; but while the former has a narrow groove cut to receive the plate which is fixed, the groove of the latter is in the plate, and receives a ridge from the back, which is not fixed, but allows the saw to slide backwards or forwards, as it is thrown out or drawn in. The tenon-saw is single, but that of the insect is double, being, in fact, two distinct saws; in using which, one is thrown out, and, as it returns, the other is pushed forward; and this motion proceeds till the incision is made, when the saws, receding from each other, conduct the egg between them into its place. In the tenon-saw the teeth are alternately bent towards the sides, that the cut may allow the blade to move easily; and to answer the purpose in some degree, the teeth of the insect's saw are a little twisted, and on the outer side of each small teeth are placed, to act as a rasp.



VARIOUS WINGS OF INSECTS.

When by this extraordinary instrument a groove is made, and an egg placed in the cavity, about two-thirds of the saw is drawn into its sheath, and a liquid, something like soap-lather, is dropped over the egg, to glue it to the spot, or defend it from the juices of the tree. One fly was observed to make six grooves in succession, which occupied her about ten hours and a half.

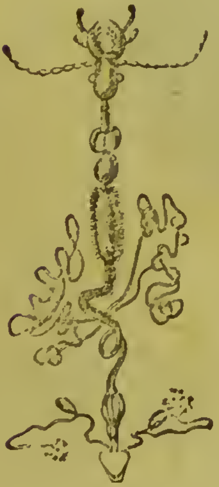
The diversities in the wings of insects are innumerable; we give only a few examples.

The *internal* structure of insects is no less remarkable than the external. Thus good air is indispensable to them, as it is to other creatures; but they do not breathe by the mouth, and are not provided with lungs. In caterpillars, as well as others, the air is respired by breathing tubes—usually eighteen in number—placed along the sides, the mouths of which may be seen moving, as the air passes in and out, from ten to thirty times in a minute. When these are covered with oil, or any other matter preventing the entrance of the air, the insect, being unable to breathe, is suffocated, and dies, as was observed by Aristotle two thousand years ago.

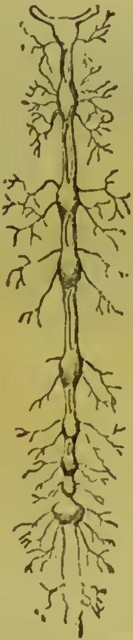
CATERPILLAR OF SCARABÆUS, SHOWING THE BREATHING ORGANS.

The internal organs by which the air received is distributed are very wonderful. The structure of the trachea of the cossus, for example, is admirably adapted to its purpose. Had its vessels been composed of membrane—a web of interwoven fibres—they could not possibly have been kept from closing; but this is guarded against, and the necessary tension or stretching of the tubes provided for by the intervention of a corkscrew-like cartilaginous, or bony thread. Thus, however small the vessels, or violent the contortions of the insect, they are always sure to remain open. The two tracheæ, moreover, give rise to two hundred and thirty-six tubes, and, adding the smaller ones into which they ramify, have, in fact, one thousand and four branches. These are necessary; for they are not only carried along the intestines and spinal marrow, penetrating and filling every ganglion or knot, but they are also distributed to the skin and every organ of the body, and accompany the most minute nerves throughout their whole course!

The structure of the alimentary canal in insects is wonderfully diversified. Not only are differences discoverable as we pass from family to family, and from species to species; but the same individual will often be found to have a canal quite different, according as it is examined in its grub or perfect state.



ALIMENTARY CANAL.



NERVOUS SYSTEM.

In the caterpillar there is a most capacious stomach, which, indeed, fills a large portion of its body; but in the butterfly the stomach is diminished to a thread. Heroldt traced these changes, as they successively occur, from the caterpillar to the butterfly. In the caterpillar he found the gullet, the honey stomach, the true stomach, and the intestines capacious; but two days after its first change all these were visibly diminished, as well as the silk reservoirs, which, in a chrysalis eight days old, wholly disappeared; while the base of the gullet was dilated into a crop, and the stomach was still more contracted into a spindle form. When near its change into the perfect insect, the gullet is still more drawn out, while the crop, still small, is now on one side of the gullet; and in the butterfly is enlarged into a honey stomach.

All these variations exactly accord with the temporary or constant mode of life of the creatures in whom they appear. "Thus," says Cuvier, "the voracious larvæ," or grubs, "of the Scarabæi and butterflies have intestines ten times as large as the winged and sober insects, if I may use such an expression, to which they give birth."

In two beetles which have been examined, a remarkable difference has been observed. In the one there is no crop or gizzard, but the stomach is fringed on each side, and there are three pairs of bile-vessels; while in the other the gullet is dilated into a crop which includes a gizzard, in which the Divine wisdom is singularly apparent; for though so minute as scarcely to exceed a large pin's head in size, it is stated to be provided internally with more than four hundred pairs of teeth, moved by a far greater number of muscles. The object of this extraordinary structure is the comminution, or reducing to powder, of the timber which this beetle has to perforate and probably devour. Its stomach has only two pairs of bile-vessels.

Insects are also furnished with organs of secretion, which, in general, are membranous vessels, that float in the blood or nutritive fluid, and secrete from it silk, saliva, jelly, or gluten, varnish, scent, and poison.

The existence of a brain in insects has been denied, but they have certainly a part analogous to this important organ, in its situation, and in its sending forth nerves to the principal organs of the senses. From this, which consists of two lobes, proceeds the spinal marrow—a cord which is sometimes single, but usually double, uniting at intervals, expanding into several knots or ganglions, each of which may be considered in some degree as a centre of vitality, or little brain.

The nerves of insects, as of other animals, are white filaments, running from the brain and spinal marrow to every part of the body. In the nervous system of insects there is, however, great variety, and a gradual change takes place in it when insects undergo their metamorphoses; doubtless that it may be adapted to the altered functions of the animal in its new stage of existence.

The muscles are the organs of motion, being endowed with a remarkable, though inexplicable power of contraction. Each of them consists of minute fibres or threads, made, as it were, into a bundle. Their origin in the higher animals is from the blood; but in insects they are derived from a certain accumulation in the larvæ, as a store of nutriment for the development and growth of the organs of the perfect insect while in the pupa state. The blood in which the different organs float that is not required for their nutriment, is supposed to be expended in its formation. In the pupa of the cabbage-butterfly a naturalist observed that this substance first assumed a fine, flocky appearance, and a blue-green colour; and that from it were produced tender bundles of muscular fibres, extending in various directions, the substance itself decreasing in proportion as they were formed.

SCARABÆUS NASICORNIS, MALE AND FEMALE.

The muscles of insects vary in shape; their ordinary colour is white, but it is said that those for flight differ from the rest, by being of a deeper and reddish colour. In general they may be regarded as divided into primary and secondary; the primary being the muscles by which the principal movements of any organs are effected, and the secondary the cause of subordinate movements. Almost every muscle has its antagonist, the action of which is in an opposite direction: so that, when it is equal, the organ to which they are attached remains without motion; but when that of one preponderates, a proportionate movement takes place.

Lyonnet counted the muscles contained in the body of the caterpillar of the cossus. He found in the head 228; in the body, 1,647; and enveloping the intestines, no less than 2,186; which, after deducting 20 that are common to the gullet and the head, gives a total of 4,061. Only 529 have been counted in the human subject; so that this little creature has 3,532 muscles more than ourselves.

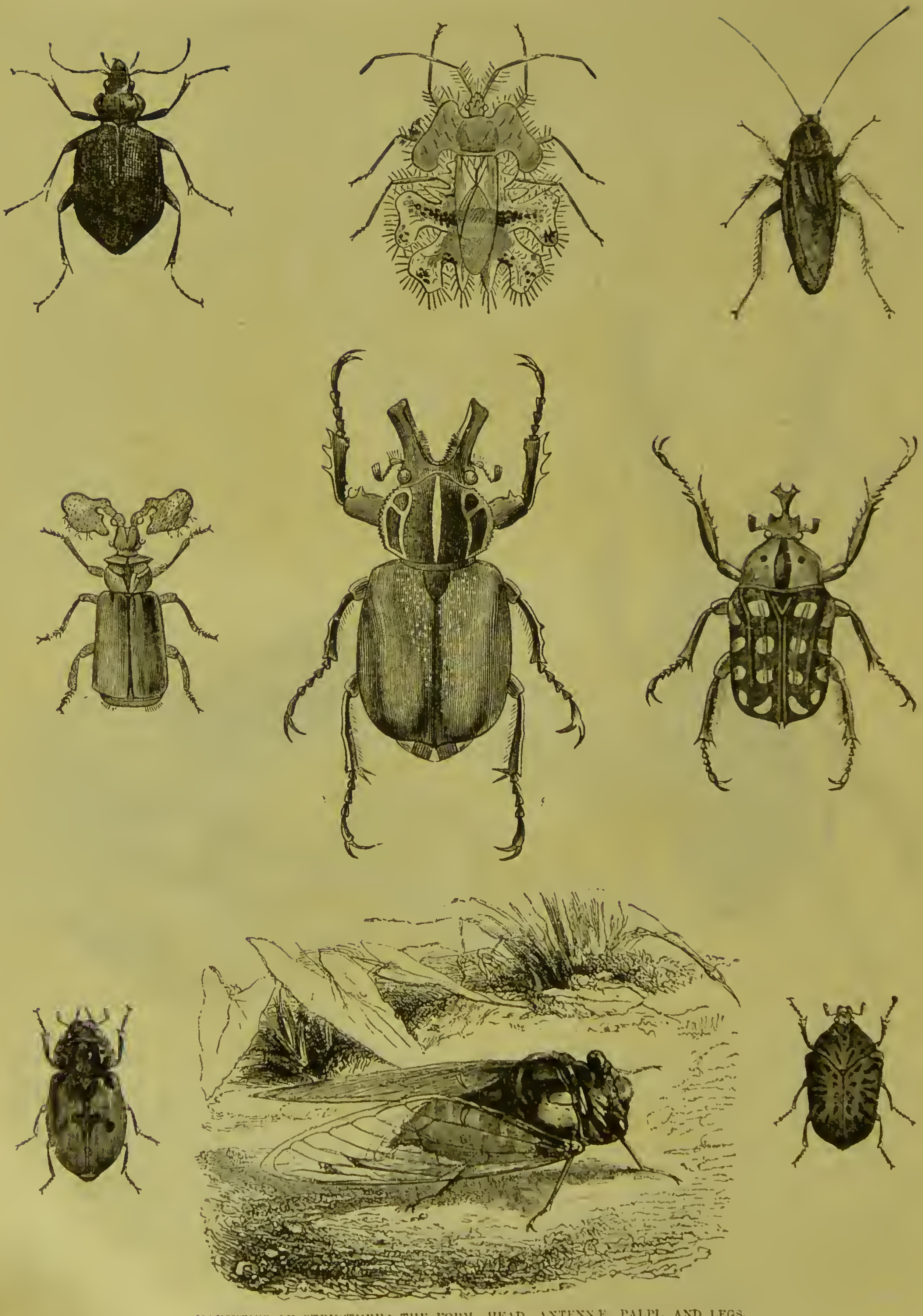
Some insects can leap two hundred times their own length; and Bradley asserts that he has seen a stag-beetle carry a wand half a yard long and half an inch thick, and fly with it several yards. Others can resist pressure in a wonderful degree. One, for instance, an inhabitant of muddy pools, has been occasionally taken up with the water used in paper-making, and according to Linnæus, has resisted without injury the immense pressure given to the surrounding pulp.

"It is fortunate," say Messrs. Kirby and Spence, "that animals of a larger size, especially noxious ones, have not been endowed with a muscular power proportionable to that of insects. A cockchafer, respect being had to their size, would be six times stronger than a horse; and if the elephant, as Linnæus has observed, were strong in proportion to the stag-beetle, it would be able to pull up rocks by the root, and level mountains. But the Creator in these little creatures has manifested his almighty power, in showing what he could have done, had he so willed; and his goodness in not creating the higher animals endued with power and velocity upon the same scale with that of insects, which would probably have caused the early desolation of the world which he has made."

As "the blood is the life," so it may be expected to appear, in some way or other, throughout animated nature. There is not, however, in all cases, a real circulation. If, for instance, the back of any smooth caterpillar, with a transparent skin, be attentively examined, an evident pulsation will be perceived, as though a fluid were pushed along a narrow tube, at regular intervals, towards the head. Dissection, too, has proved that most insects have such a tube, placed immediately under the skin, and furnished with numerous air-vessels; and that this contains a fluid propelled in regular pulsations of from twenty to a hundred per minute, varying as the weather is colder or warmer. In the cossus these pulses were observed to begin at the eleventh segment, and to pass from segment to segment, till they arrived at the fourth, where they terminated. This vessel Kirby describes as the "first step towards a heart." The fluid it contains is very abundant: in the animal it resembles water: when collected in drops, it becomes more or less yellow, and even orange; but when examined under a microscope, it appears filled with a prodigious number of transparent globules, of incredible minuteness. The dispersion of this fluid appears to be universal, so that all the parts and organs contain it in a greater or less degree; and in many insects, if an antenna or a leg be broken, a drop of fluid flows out at the wound. And as manifest are the wisdom and goodness of the beneficent Creator in the fact observed by Cuvier, that as the blood, for want of a circulating system, is not able to seek the air, the air goes to seek the blood!

THE STAG BEETLE.

STAG BEETLE, MALE AND FEMALE.

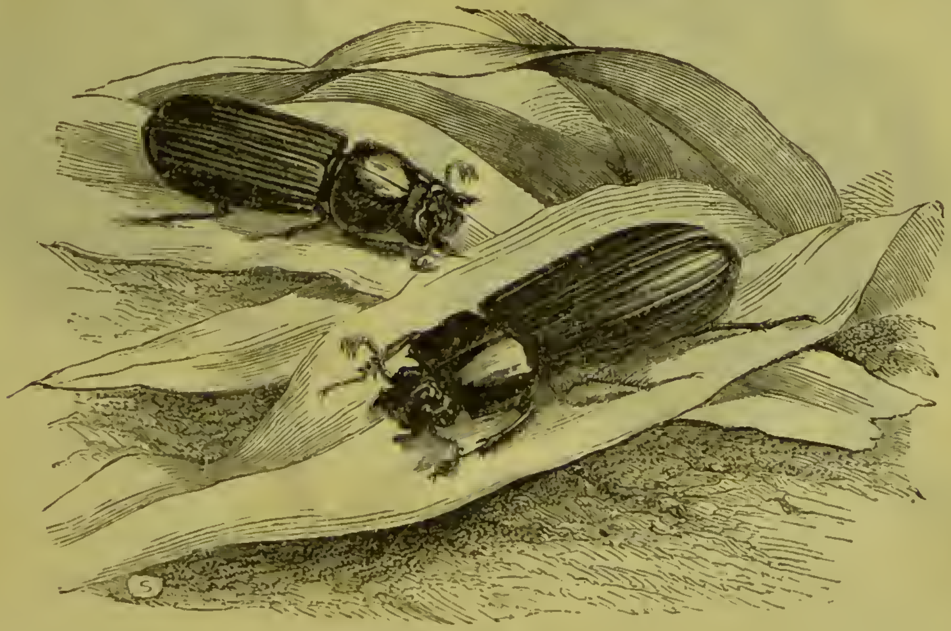


VARIETIES OF STRUCTURE: THE FORM, HEAD, ANTENNÆ, PALPI, AND LEGS.

Spiders and scorpions have, however, circulating vessels. The heart of the former is a long dorsal vessel, as in insects, but supposed to be confined to the abdomen. On each side of the heart of the latter are vessels which may be assimilated to veins, while others cross them, and are the arteries.

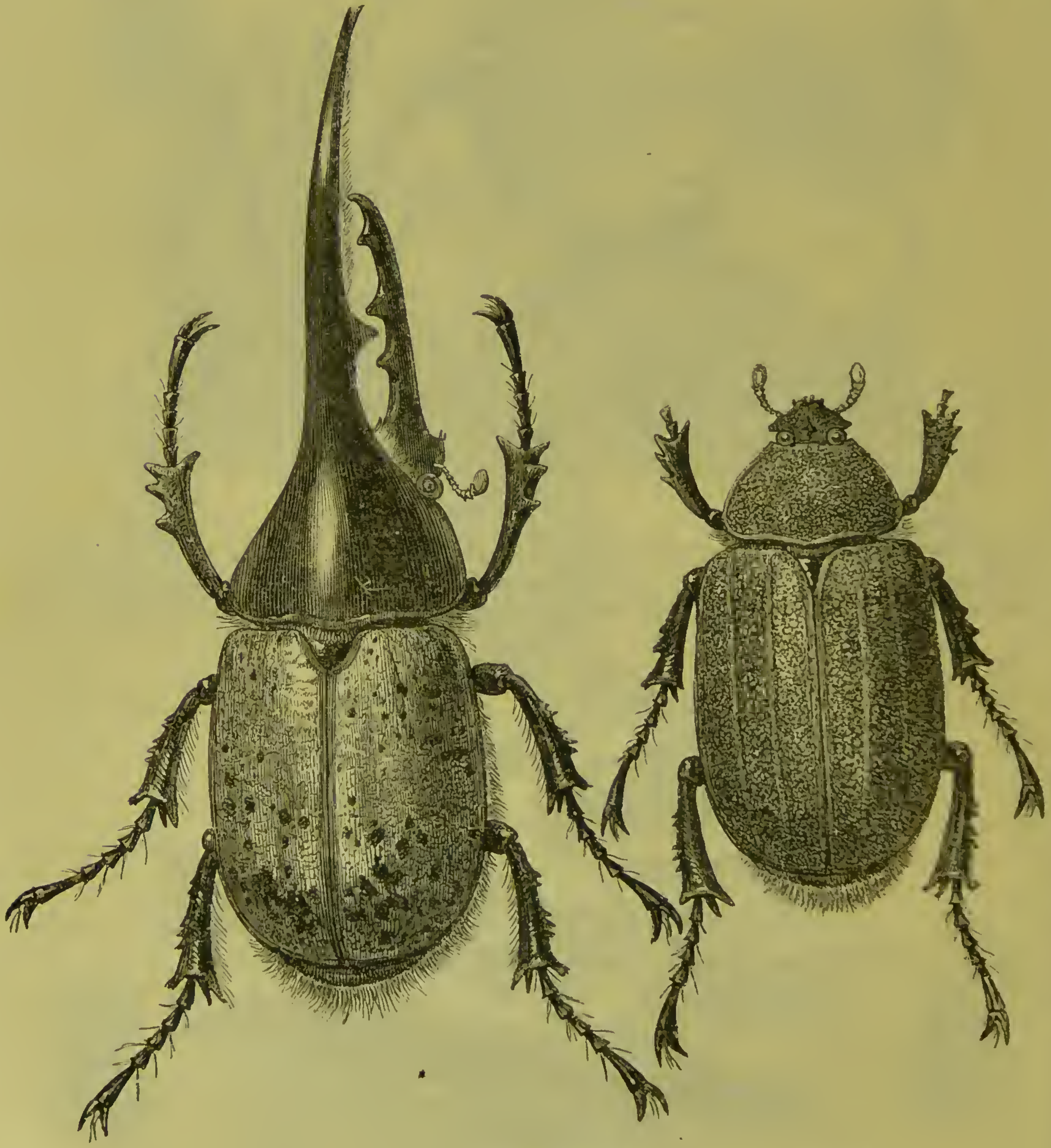
"The world, by difference, is in order found." In every direction diversity is apparent, and that which prevails among the insect tribes ought not to be overlooked. Among them, for instance, contrary to what generally occurs in vertebrate animals, the size of the female is often larger than that of the male. In some species the sexes are partly or wholly of a different colour. Other species differ as to their sculpture. In general the males are more fitted for locomotion, and more locomotive; and the females, on the contrary, are necessarily more stationary. And this for an obvious reason: the law is, that the male shall seek the female, and therefore he is peculiarly gifted for this purpose. Hence, while his partner in many cases has very simple antennæ, he has very complex

DRAGON FLIES.



PASSALUS TRIDENS, JAVA.

ones; and while she has either no wings, or only rudiments of them, he is amply provided with them. In the common dragon flies, which may be seen hawking over every pool, the abdomen of the male is usually slate colour, while that of his partner is yellow, but with darker side spots. Reaumur, however, noticed some males that were of the same colour with the females. Schelver observed, when he put the skins of these insects into water, that the colours common to both sexes were in the substance of the skin, and remained fixed; while those that were peculiar to one could be taken off with a hair pencil, and coloured the water; which, therefore, were superficial, and, as it were, laid on. The yellow males, therefore, that Reaumur observed, were probably such as had the superficial blue colour, which distinguishes them, washed off. In



MALE. SCARABÆUS HERCULES. FEMALE.

one case, the males are of a lovely silky blue, and the females green; in another the male is wholly black, and the female wholly grey, and of so very different an aspect, that they were long regarded as distinct species.

The sexes of insects vary also in their sculpture. Thus the wing cases of the females of many of the larger water-beetles are deeply furrowed, while those of the males are quite smooth and level; and the thorax of the female, in several species of colymbetcs of the same tribe, has on each side several tortuous impressed lines or scratches, like net-work, which are not to be discovered in the male.

Even in the larva and pupa states, a practised eye can judge, from their greater size, which individuals will become females. There are, however, some exceptions to this rule. The size of the female in ordinary cases seems connected with her office as a mother, that sufficient space may be allowed for the vast number of eggs she is to produce; and though in the majority of cases the disproportion between the two sexes is not very considerable, yet in some few it is enormous. Reaumur mentions a beetle, the male of which is so small compared with the female, that a bull not bigger than a sheep, or even a hare, set by the side of the largest cow, would aptly show the contrast. The female of many gall-insects is so large compared with the male, that the latter traverses her back as an ample area for a walk. The male of the Scarabæus Hercules has an extraordinary anterior, of which the female is destitute.

Amongst the insects that suck the blood of man or beast, such as gnats or horse-flies, it is the female alone that is bloodthirsty, the males contenting themselves with the nectar of flowers. But the difference of characters in the sexes has been more noticed in those that live in societies, and is quite the reverse of what takes place in the human species. While the females and workers are laborious and active, diligent and skilful, wise and prudent, courageous and warlike, the males, on the contrary, have no such qualities. Though till a certain period they are supported at the expense of the community, they take no part in its labours, either in collecting and forming the public stores, or in feeding and attending the young. They are idle, cowardly, and inactive; have neither art nor skill of any kind, and are unprovided with the usual offensive weapons of their species. These observations, in their full force, apply particularly to the hive-bee, and partially to the other social insects; though there are, it must be admitted, some exceptions to this slothful character in the males. Reaumur states that the male humble-bees are not an idle race, but work in concert with the rest to repair any damage or derangement that may befall the common habitation; and the male wasps are, in a certain way, very industrious. They do not, indeed, assist in building the nest, and in the care of the young brood; but they are the scavengers of the community; for they sweep the passages and streets, and carry off all the filth.

The range of insects in search of food is very extensive. The vegetable kingdom presents to them a vast field, while the larger animals are limited to a comparatively small portion. Separate the grasses, and a few herbs and shrubs, and of the thousands of plants which cover the face of the earth, the rest are disgusting to them, or absolutely poisonous. Yet how plenteous is the feast to which the insect tribes are invited. From the gigantic banyan, which covers acres with its shade, to the tiny fungus, which the eye can scarcely perceive, there is one immense banquet, of which they may partake. It is probable that not a single plant exists, even of those which to others are most nauseous and poisonous, that does not yield to some insect or other delicious food.

The entomologist, whether in all the buoyancy and ardour of youth, or falling into the "sere and yellow leaf," possesses a peculiar advantage over those engaged in the examination of other natural objects. The specimens of the geologist or mineralogist are frequently of considerable bulk and weight, and require a corresponding space for their scientific arrangement. The ornithologist may—thanks to Mr. Waterton—secure for his herons, swans, and falcons their respective plumage and attitudes, but he must do so at considerable cost, and requires a range of large cases for their display and classification. The loveliest rose that ever unfolded her petals to the skies of June, or the sweetest violet that ever yielded her fragrance to the breath of April, are alike reft of their beauty when transferred to the *hortus siccus* of the botanist. But the colours of insects are not evanescent and fugitive, but fixed and durable, surviving their subject, and adorning it as much after death as they did when it was alive; and a single drawer, of moderate dimensions, will hold hundreds of them, in all the richness of their hues and the variety of their forms.

The number of the species of insects surpasses all calculation; and how to form any correct idea of such a diversified multitude seems, at first sight, beyond possibility. Yet still, existing systems show that they may be classified. Our object, however, as it has hitherto been, is, while using the technicalities employed in science, to explain them, so far as practicable, for popular purposes. We would, therefore, remark, that the far greater number of insects have been arranged in orders, under Latin terms, but we shall proceed to consider the greater number of them as

Sheath-winged,[*]
Straight-winged,[†]
Half-winged,[‡]
Nerve-winged,[§]
Membrane-winged,[||]
Scale-winged,[¶] and
Double-winged;[**]

adding to these, as we pass onwards, other insects which may be differently described—the few, however, among the many.

SHEATH-WINGED INSECTS.

This order includes the Beetles. The beetle has not only two large membranaceous wings, but they are protected from external injury by two very hard, horny wing-cases, termed by entomologists *elytra*. The old English name was "shard;" and it is used by Shakespeare, in his "Antony and Cleopatra," "Cymbeline," and "Hamlet." Thus it is said:—

> "Often to our comfort do we find
> The sharded beetle in a safer hold
> Than is the full-winged eagle."

The wings of beetles are usually very ample, often of a substance between parchment and membrane. The nervures that traverse and extend them, though not numerous, are stronger and larger than those in the wings of insects of other orders, and are so dispersed as to give perfect tension to the organ. When at rest, with a few exceptions, they are folded transversely under the elytra, or wing-cases, generally near the middle, with a lateral longitudinal fold, but occasionally near the extremity. When they prepare for flight, their antennæ being set out, the elytra are usually opened, so as to form an angle with the body, and admit the free play of the wings; and then they fly off, striking the air by the vertical motion of these organs, the elytra all the while remaining immovable.

Beetles seem to be sometimes gathered into imperfect societies. Their most remarkable migrations are those recorded by M. Lacordaire, who states that for two successive years, when he was at Buenos Ayres, that city was, for about eight days in the spring of each year, inundated by such millions of one beetle,[††] which arrived daily towards nightfall, that it was necessary every morning to sweep them from the exterior of the houses to a height of several feet above the ground.

Many beetles, when taken, show their alarm by the emission of a shrill, sibilant, or croaking sound, which some compare to the chirping of young birds, produced by rubbing their elytra with the extremity of their abdomen. When this noise is made, the movement of the abdomen may be perceived; and if a pin is introduced under the elytra, it ceases.

THE DORR, CLOCK, OR DUNG BEETLE.

The sound given forth by this insect has often been noticed. Thus Collins says:—

> "Now air is hushed, save——
> —— where the beetle winds
> His small, but sullen horn;
> As oft he rises, 'midst the twilight path,
> Against the pilgrim borne in heedless hum."

Hogg describes the beetle as singing "the lullaby of the departing day;" and again he says:—

> "The beetle began his wild airel to tune,
> And sang on the wynd with an eirysome croon,
> Away on the breeze of the Dee."

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[*] Coleoptera.
[†] Orthoptera.
[‡] Hemiptera.
[§] Neuroptera.
[||] Hymenoptera.
[¶] Lepidoptera.
[**] Diptera.
[††] Harpalus cupripennis.

Shakespeare, however, is still more expressive :—

> " Ere the bat hath flown
> His cloister'd flight ; ere to black Hecate's summons,
> The shard-borne beetle, with his drowsy hum,
> Hath rung night's yawning peal, there shall be done
> A deed of dreadful note."

This insect digs a deep cylindrical hole, and carrying down a mass of dung to the bottom, in it deposits its eggs. " This evening," says Mr. Knapp, " my attention was called to these dorrs in particular, by the constant passing of such a number as to constitute something like a little stream ; and I was led to search into the object of their direct flight, as in general it is irregular and seemingly inquisitive. I soon found that they dropped on some recent nuisance ; but what powers of perception must these creatures possess, drawn from all distances and directions by the very little fœtor which, in such a calm evening, could be diffused around ; and by what inconceivable means could odours reach this beetle in such a manner as to raise so inert an insect into action ! But it is appointed one of the great scavengers of the earth, and marvellously endowed with powers of sensation and means of effecting this purpose of its being. Exquisitely fabricated as it is to receive impressions, yet probably it is not more highly gifted than any of the other innumerable creatures that wing their way around us, or creep about our paths ; though by this one perceptible faculty, thus ' dimly seen,' it excites our wonder and surprise. How wondrous, then, the whole ! "

Many beetles of one species * roll together wet dung into round pellets, deposit an egg in the midst of each, and when dry push them backwards with their hind feet, sometimes three or four assisting, into holes of the surprising depth of three feet, which they have previously dug for their reception, and which are often several yards distant. Frequently the road lies across a depression on the surface, and the pellet when nearly pushed to the summit rolls back again. But these patient creatures are not easily discouraged. They repeat their efforts again and again, and in the end their perseverance is rewarded with success.

THE TUMBLER DUNG BEETLE.†

Catesby describes the proceedings of the Tumbler Dung Beetle of America. He attentively admired their industry, and mutual assisting of each other, in rolling their globular balls from the place where they made them to that of their interment ; which is usually the distance of some yards, more or less. This they perform by raising their hind parts, placed foremost, and forcing along the ball with their hind feet.

THE TUMBLER DUNG BEETLE.

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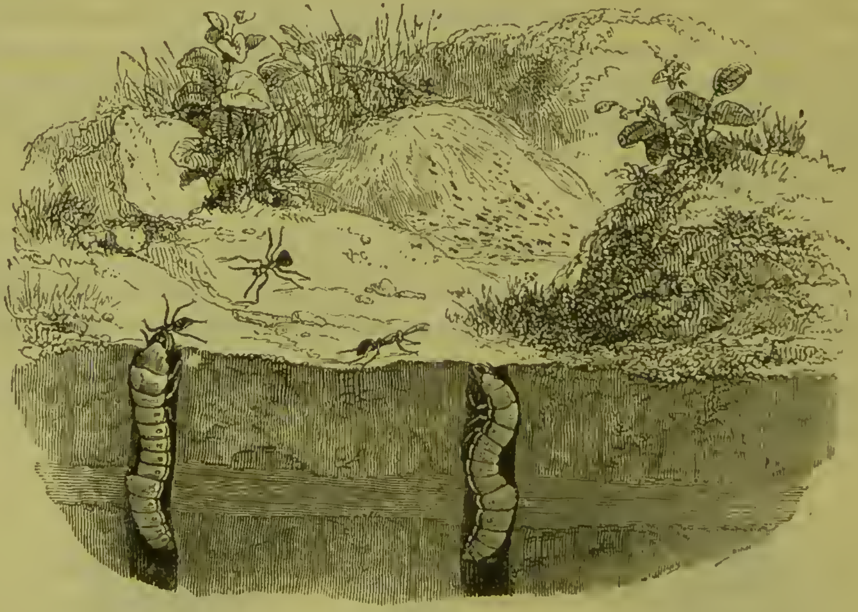
* Geotrupes stercorarius. † Scarabæus pitularius.

Two or three of them are sometimes engaged in trundling one ball; which, from meeting with impediments on account of the unevenness of the ground, is sometimes deserted by them. It is, however, attempted by others with success, unless it happens to roll into some deep hollow or chink, where they are constrained to leave it; but they continue their work, by rolling off the next ball that comes in their way.

None of them seem to know their own balls, but an equal care for the whole appears to affect the entire community. They form these pellets while the dung remains moist, and leave them to harden in the sun before they attempt to roll them. In their moving of them from place to place, both they and the balls may frequently be seen tumbling about over the little eminences that are in their way. They are not, however, easily discouraged; and, by repeating the attempts, usually surmount the difficulties.

The perfect cleanliness of these insects, and of all of kindred habits, is a very notable circumstance, when we consider that nearly their whole lives are passed in burrowing in the earth and removing nuisances; yet such is the admirable polish of their coating and limbs, that we very seldom see any soil adhering to them. Some, indeed, on first emerging from their winter's retreat, are commonly found with earth clinging to them, but the removal of this is one of the first operations of the creature; and all the beetle race, the chief occupation of which is crawling about the soil, and such dirty employments, are, notwithstanding, remarkable for the glossiness of their covering, and freedom from defilements of any kind.



CATERPILLARS OF CICINDELA.

One genus comprises insects very remarkable in the larva state. They inhabit holes in the earth, the entrance to which, while the occupant lies in ambuscade, is closed by the upper portion of its head. They are exceedingly voracious, and seize whatever insect prey approaches within their grasp. When one has completely succeeded in forming a habitation, it sticks at the entrance by means of the hooks of its tubercles, and the insect exactly closes the hole with its broad and flat head, which answers all the purpose of a trap-door. Here the grub remains immovable, ready to seize the first insect that passes, which is eagerly devoured. Its voracity is enormous, and even its own species do not escape from its devouring jaws. On the arrival of the time for undergoing its transformation into a pupa, it carefully closes the mouth of the den, and retires to the bottom in security. When danger threatens, they rapidly descend into their subterranean retreats. When two of these larvæ happen to form their

CICINDELA.

domiciles in the immediate neighbourhood of each other, the stronger devours the weaker, to obviate any interference with his own pursuits.

The perfect insects are extremely beautiful, of light and active forms, exceedingly swift in their motions, and adorned by brilliant metallic colours. The prevailing hues are different shades of golden green, spotted with white or pale yellow. They frequent dry and sandy soils, where they seem to enjoy the prevalence of bright sunshine. More than two hundred species of this genus are known. They were named by Linnæus the tigers of the insect tribes, and are distributed over all the regions of the earth.

CARABUS VIOLACEUS.

CARABUS INQUISITOR.

Another genus * of a family † contains within itself no fewer than about eight hundred species already discovered. Their general form may be observed in the *Carabus inquisitor* and *Carabus violaceus*, of a dull black, and having the margin of the elytra of a copper-like hue, in the neighbourhood of London. A creature of this genus is represented in the engraving as attacking a cockchafer. Another, *Procerus scabrosus*, is the largest of the carnivorous beetles known.

CARABUS ATTACKING A COCKCHAFER.

The insects of another tribe give forth frequently a fœtid odour, and exude an acrid fluid. Their habits and economy are exceedingly various. Some conceal themselves in the earth; others beneath stones, or the bark of trees. They are active in their movements, and are very generally distributed, being, however, more characteristic of temperate than equatorial regions.

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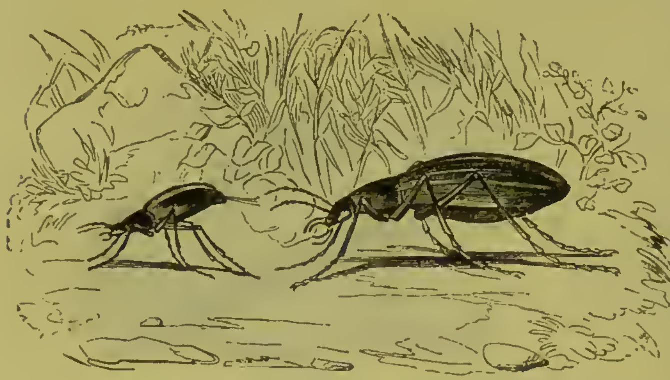
* Carabus. † Carabidæ.

THE BOMBARDIER BEETLE.*

THE most common species of this insect, occasionally found in many parts of Britain, when pursued by its great enemy,† seems at first to have no means of escape, when suddenly a loud explosion is heard, and a blue smoke, attended by a very disagreeable scent, is discharged, which immediately stops the progress of the assailant. When it has recovered the effect of it, and the pursuit is renewed, a second discharge again arrests its course. The Bombardier can fire its artillery twenty times in succession, if necessary, and so gain time to effect its escape. Another species‡ makes similar explosions; when irritated, it can give ten or twelve good discharges; but afterwards, instead of smoke, it emits a yellow or brown fluid. The apparatus of the organ which produces the smoke, is double; that is to say, there is one on each side of the abdominal cavity. The Calosomæ are tolerably large insects, and often adorned with metallic colours of the most brilliant dye.


A BOMBARDIER'S REPULSE OF AN ENEMY.

M. Geoffroy gave some of these insects a generic name§ on account of the injury he supposed them capable of inflicting on cattle; and it is possible that the caustic humour with which many are imbued might be productive of bad effects in the event of their being swallowed with their vegetable food.

THE GIANT BUPRESTIS.

It is mentioned by the younger Geoffroy that, while he was collecting insects on the coast of Senegal, a negro brought him a jar containing many thousand specimens of a small species, which had evidently been previously collected by design. On inquiry, he found that they were used for making soap, some of which, of a black colour, he afterwards examined, and found it to possess all the qualities of the European article.

A species of Buprestes,‖ about an inch long, is of a golden or coppery green, densely punctured, and with little tufts of yellowish or reddish hairs. It sometimes hangs in such abundance on a shrub as to make it appear all laden with flowers. Another species, as its name* implies, of the larger size, has the thorax cupreous, mingled with brilliant green, and two large spots like burnished steel; the elytra tridendate at the end, and are cupreous in the centre, and bronze-green on the margin, with imprisoned points and some elevated lines and ridges.

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* Brachinus crepitans. † Calosoma inquisitor. ‡ Brachinus displosor. § Buprestis. ‖ B. fasciculata.

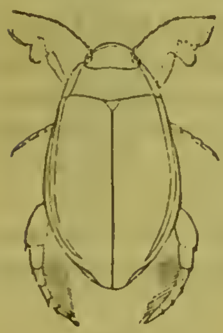
SCARITES GIGAS.

The genera of the second section† possess several characters in common. As they are destined to live chiefly beneath the surface of the earth, their structure is specially adapted to their mode of life. Thus, excavating holes scarcely exceeding their body in width, some provision is necessary to enable them to turn their anterior portions in different directions; otherwise their progress would be nearly in a straight line. This object, which is analogous to that which is provided for in moles and other burrowing quadrupeds by the flexibility of the vertebral column, is attained by the interposition of a narrow cylindrical pin between the abdomen and thorax, on which the beetle moves as on a pivot, its hinder angles being rounded off that its motions may be performed with greater facility. The form of the antennæ is likewise in beautiful accordance with the habits of the insects. They are composed of nearly globular articulations, attached to each other by a slender filament, bearing some resemblance to a series of beads rather loosely strung. In this way they are rendered peculiarly pliant and flexible.

Hamlet asks—

> "Dost know this water-fly?"

The old genus, *Dytiscus*, embraced a vast assemblage of aquatic insects, which more minute observers of modern times have partitioned into many genera. Although water is their favourite element, they survive for a long time on moist land, and most of them fly about in the evening and morning twilight, and even during the darkness of the dewy night, with great power and celerity. They vary considerably in size, according to the species, and are fierce and voracious in their habits. They are frequently observed resting on the surface of the water, with their legs expanded, their heads downwards, and the terminal segment of their bodies in contact with the air. It is there that they carry on the process of breathing, for they cannot respire except by bringing a globule of atmospheric air in contact with the stigmata, which are placed on the sides of the abdomen.


DYTISCUS.

Another genus of the same family‡ are found on the surface of the stagnant waters of marshes, lakes, and ditches, where they are seen to swim, and, as it were, to run, usually assembled in troops, and describing circles and pirouettes with the most surprising swiftness and agility. They very much approach the preceding, having, like them, the feet adapted for swimming; yet still they are marked by some peculiarities which constitute them a distinct genus.§

WATER BEETLE. (*Dytiscus marginalis, female.*)

NEPA CINEREA.

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* Buprestis gigas. † Scaritides. ‡ Gyrinus. § Natator.

Geoffroy separates a genus* from the *Dytiscus* of Linnæus. It is composed of a good many species, the major part of which inhabit Europe. Some of them are of large, and others under the middle size. The colours of all are obscure, or of no great brilliancy. These insects are found in fresh waters, in lakes, rarely in rivers, but most frequently in marshes and ponds. It is usually at the approach of night that they issue from the water to fly, and transport themselves from one marsh to another. They make a humming sound as they fly along, similar to that made by the *Scarabœi.*

LARGE WATER BEETLE. (*Hydrophilus piceus.*)

M. Felix Miger states that he has seen the one represented devour, with avidity, water-snails and aquatic larvæ; but its principal food consists of aquatic plants.

The insects of one genus, † in their various states, inhabit the quiet waters of ponds, lakes, and marshes. They swim more leisurely than any of their congeners, and often proceed along the surface of the mud below in search of the minute insects of which they make their prey, and which they seize with their anterior feet. Their eggs are of an oval form, and when examined by a microscope are seen to be covered with an aigrette of seven small threads. One of these insects is of an ash colour, the upper part of the abdomen red, the tail shorter than the body.

The members of another family, ‡ speaking generally, are to be found in fresh and humid places under stones, or under the bark of dead and rotten trees. They may be seen running in the fields, gardens, or highways, when in search of their prey. They are very courageous and extremely agile; provided equally with strong feet and good wings, they run with great swiftness, and fly with the utmost facility. They destroy the insects which live in cow-dung, dunghills, and in the branches of trees, carrying on with them an unceasing war. Sometimes they surprise them in their retreats; at others, they pursue them in the fields, attack them with advantage, and molest them with bitterness. But they appear to have been more especially designed for the reduction of cocoons to their final state of dissolution.

STAPHYLINUS HIRTUS.

STAPHYLINUS OLENS.—STINKING ROOT BEETLE.

A numerous tribe of insects § remain on flowers, plants, and even on the ground or turf; they lower the head in walking, and when they are approached they suffer themselves to fall to the ground, applying the feet under the lower part of the body. The legs are very short, and when the creature falls on its back, which it frequently does, it can only assume its natural position by springing upwards, which it is enabled to do by bringing a projecting point, with which it is provided, into sudden contact with a groove formed in its body.

The larvæ of *Elater striatus* are said to do much injury by attacking the roots of wheat. One grub known in this country by the name of wire-worm is an *elater* in the early state. It lies under ground for several years, feeding on the roots of grain and vegetables. It is partial to land newly broken up, and does great damage in gardens recently converted from pasture land.

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* Hydrophilus. † Nepa. ‡ Staphylinus. § Elatirides.

ELATER PECTICORNIS.

ELATER STRIATUS.

Some of the American species are remarkable for the fine phosphoric light which is observed to emanate from them during the evening twilight, and when the shadows of night have fallen upon the forests. One of them was transported to Paris under the form of a chrysalis or larva, and having made its escape into the streets, after the assumption of the perfect state, it greatly astonished the inhabitants of the Faubourg St. Antoine.

FIRE-FLY.

The Fire-fly is an insect of the beetle tribe,* about an inch in length and one-third in breadth; it gives out its principal light from two transparent eye-like tubercles, placed upon the thorax; but there are also two luminous patches concealed under the elytra, which are not visible except when the insect is flying, at which time it appears adorned with four brilliant gems of the most beautiful golden blue lustre; in fact, the whole body is full of light, which shines out between the abdominal segments when stretched. We are told that the original natives (a race whose memory even is passing away) were formerly accustomed to employ these living lamps, which they called *Cucuij*, instead of candles, in their evening household occupations. In travelling at night they used to tie one to each great toe, and in fishing and hunting required no other flambeau. Besides this, they were sought for and encouraged into houses, and especially sleeping-rooms, as extirpators of gnats, which constitute a great part of their food. The fire-fly is common in the intertropical regions of the American continent, as well as the West Indies. In addition to the *E. noctilucus* and the *E. ignitus*, several other allied species are also luminous.

GLOW-WORMS, MALE AND FEMALE.

Several genera are contained in the next family.† Among these is the Glow-worm—of which there are nearly 200 species. The perfect female of a beetle, destitute of wings and elytra, with which the male fly is furnished, kindles her light, which issues from the last three segments of her body, and is of a beautiful sulphur colour, and always puts it out between eleven and twelve o'clock, shining no more for the rest of the night.

A very extensive group of beetles‡ is known by about 3,000 species in the collections of naturalists. They are distinguished from others by peculiarities of the antennæ, and the club with which they terminate also varies considerably in form. In this group it is mostly composed of three leaf-like joints; but sometimes the number is increased to seven, as in the common cockchafer.§ The *Scarabæi*‖ are for the most part of a black colour, or black and brown. Some few species are adorned with brilliant metallic colours.

To this genus belongs the sacred beetle of the Egyptians. It is about one inch long, or rather more, and of a black colour. It is met with not only in Egypt, but in the south of France, Spain, and Italy; and, as well as other species of the group to which it belongs, incloses its eggs in a ball of excrement, which it forms by rolling the substance by means of its hind legs. The size of the ball when completed is much larger than that of the insect.

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* Elater noctilucus.

† Lampyridæ.

‡ Scarabæidæ.

§ Melolontha vulgaris.

‖ Coprophagi.

SCARABÆI.

The image of this insect sculptured on many of the Egyptian monuments affords a melancholy proof of the superstition which reigned in a country where the arts flourished and science found an abode. It served as food for the ibis. Its remains are sometimes discovered in the earthenware repositories of those embalmed birds which are found at Saccara and Thebes. With the ancients it was a type of the sun; and it is often found among the characters used in hieroglyphic writing. Denon

SACRED BEETLE OF THE EGYPTIANS.

says: "It occupied the most distinguished place in the temples; not only as an ornament, or an attribute, but as an object of worship."

SCARABÆUS MINAS.

SCARABÆ TYPHÆUS.

All insects intended to live on animal matter, partially distributed and collected in masses, are provided with wings, which convey them rapidly, with the joint guidance of the sense of smell, to those decaying objects which they instinctively desire. Such are some of the genera about to be described.*

SCARABÆUS ENEMA.

FOUR-SPOTTED CARRION BEETLE. SILPHA QUADRIPUNCTATA

But there are others, as the *Troges horridus*,† which, being without wings, has suggested a doubt as to the probability of its feeding, like its congeners, on dried cadaverous matter. It is stated, however, that they frequent sandy deserts: a formation supposed to accord with the fact that the particles of which their food is composed are so universally spread over these arid plains as to obviate the necessity of any rapid or extended change of place.

A laborious task is performed by an insect by no means uncommon in Britain, called the burying beetle. M. Gleditsch, a foreign naturalist, had often remarked that dead moles, when laid upon the ground, and especially if upon loose earth, were almost sure to disappear in the course of two or three days, and often of twelve hours. To ascertain the cause, he placed a mole on one of the beds of his garden. It had disappeared by the third morning; and on digging where it had been laid, he found it buried to the depth of three inches, and under it four beetles, which seemed to be the agents in this singular interment. Not perceiving anything particular in the mole, he buried it again; and on examining it at the end of six days, he found it swarmed with maggots, apparently the offspring of the beetles, which he naturally concluded had buried the carcase for food for their future young. To place this beyond doubt, he continued his experiment, and in fifty days four beetles had buried, in a small space of earth, four frogs, three small birds, two fishes, one mole, and two grasshoppers, besides the entrails of a fish, and two morsels of the lungs of an ox, all evidently intended for the same purpose.

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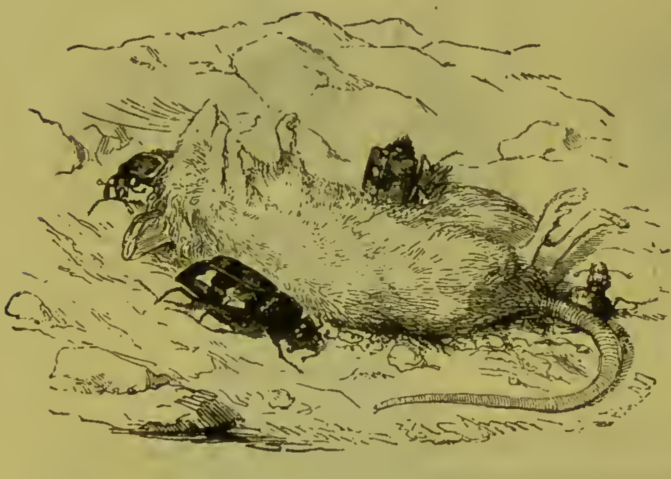
* Silpha, Hister, Dermestes.

† Pimelia, Brachycerus, &c.



CROOKED-LEGGED BURYING BEETLE. SILPHA VESPILLO.

SILPHA GERMANICA.

Fabricius was the institutor of the genus *Anobium;* so called from a Greek word, meaning *resuscitated*—the species being characterised, in common with most of their congeners, by their frequent simulation of death, and their re-assumption of activity as soon as the threatened danger is removed.

FOUR-SPOTTED MIMIC BEETLE (*Hister quadrimaculatus*).

ANOBIUM TESSELATUM

The larvæ of these insects are extremely injurious to old furniture, in which they perforate numerous round holes. Hence the genus is named *vrillette*, from the French *vrille*, a gimlet. Other species feed on flour, bread, sealing-wax, and other substances, where they form grooves or galleries, according to the thickness of their materials.

LATREILLE'S BEETLE (*Necrobia ruficillis*).

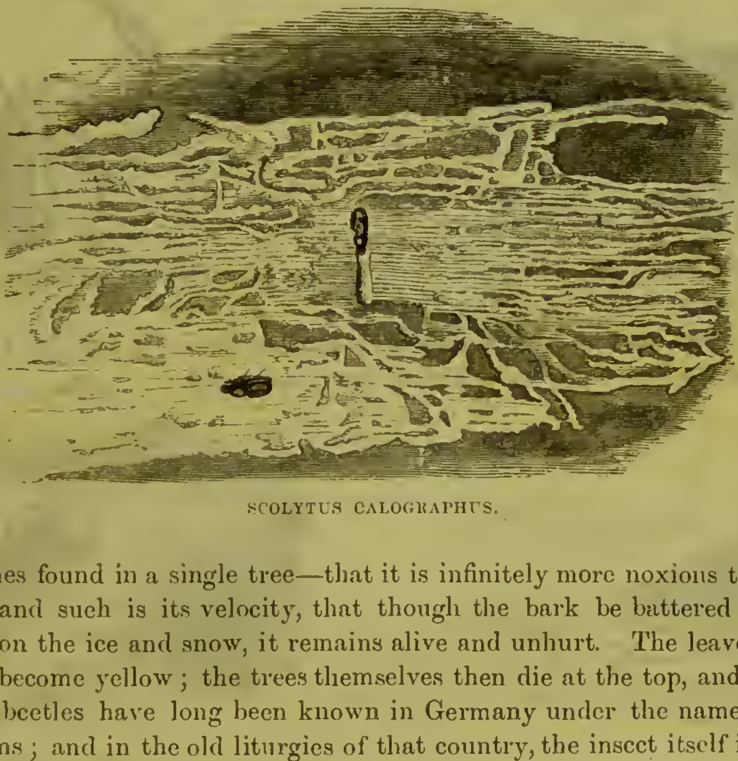
The superstitious fancy of the death-watch has arisen from the sounds emitted by the *Anobium tesselatum.*

A recent writer remarks :—"All that has been related of the heroic constancy of the American savages when taken and tortured by their enemies, scarcely comes up to that which these little creatures exhibit. You may maim them, pull them limb from limb, roast them alive over a slow fire, but you will not gain your end : not a joint will they move, nor show by the least symptom that they suffer pain. Do not think, however, that I ever tried these experiments upon them myself, or that I recommend you to do the same." One species was observed by Latreille to produce the sound called the "death-tick," by striking its mandibles upon wood. On this occasion it was immediately answered from within by a precisely similar sound.

When in small numbers the larvæ of beetles may do no great injury; but where they abound, as they often do, by interrupting the course of the descending sap, and admitting wet between the bark and wood, decay speedily ensues, and the tree perishes. Almost every kind of tree is liable to the assaults of one or more species. Even fruit-trees, as the apple, plum, &c., have each their *scolytus;* and at Rouen a species has been found which feeds on the mountain-ash.

It is to our large forest trees, however, that beetles are most injurious. Thus, the common ash is assailed by an insect, the pinnated labyrinths of whose larvæ may probably be observed on the first piece of loose bark detatched from the rough-split posts and rails made of this wood; while the bark-borer of the oak is an allied genus,* which with us does no great harm, but so abounded, some years ago, in the Bois Vincennes of Paris, that 40,000 trees were killed by it; while many of the finest elms in St. James's Park and Kensington Gardens, as well as in the promenades of the cities of the north of France, have fallen victims to another of this tribe.† All the larvæ of these various creatures, after being hatched from the eggs deposited by the parent beetle, excavate in the substance of the inner bark, and partly also in the adjoining alburnum or sap-wood, the pinnated labyrinthine appearance and fancied resemblance to letters which render them so remarkable, and which obtained for one the name of *Calographus.*

This description may be concluded by stating, as a sample of the whole, the ravages committed by one of the tribe,‡ in Germany, where it frequently attacks the inner bark in such vast numbers—80,000 being sometimes found in a single tree—that it is infinitely more noxious than any of those that bore into the wood; and such is its velocity, that though the bark be battered and the tree plunged into water, or laid upon the ice and snow, it remains alive and unhurt. The leaves of the tree infested by these insects first become yellow; the trees themselves then die at the top, and soon entirely perish. The ravages of these beetles have long been known in Germany under the name of *Wurm trökniss*—decay caused by worms; and in the old liturgies of that country, the insect itself is formally mentioned under its vulgar appellation, "the Turk."



SCOLYTUS CALOGRAPHUS.

This pest was particularly prevalent, and caused incalculable mischief, about the year 1665. In the beginning of the last century it again showed itself in the Hartz forests; it re-appeared in 1757, and arrived at its height in 1783, when the number of trees destroyed by it, in those forests alone, was calculated at a million and a half, and the inhabitants were threatened with the total suspension of the working of the mines, and consequent ruin. At this period these *Tomici*, when arrived at their perfect state, migrated in swarms into Suabia and Franconia. At length, between the years 1784 and 1789, in consequence of a succession of cold and moist seasons, the numbers of this scourge were sensibly diminished. It appeared again, however, in 1790; and so late as 1796 there was great reason to fear for the few fir-trees that were left.

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* Scolytus pygmæus.

† Scolytus destructor

‡ Tomicus typographus.

A singular beetle, common in Hungary, gnaws off the young shoots of the vine, and drags them backwards into its burrow, where it feeds on them ; on this account the country people wage continual war with it, destroying vast numbers. Five other beetles also attack this noble plant : three of them devour the young shoots, the foliage, and the footstalks of the fruit, so that the latter is prevented from coming to maturity ; a fourth destroys the young vines, often killing them the first year ; and a fifth also occasionally does considerable injury to the vine in this country, by gnawing off the young shoots.

Some species of one tribe* commit great ravages in furrieries and cabinets of natural history. Degeer designates them as *dissectors.* In fact, one cuts and reduces to pieces the insects in the collections into which it penetrates. The others devour carcases.

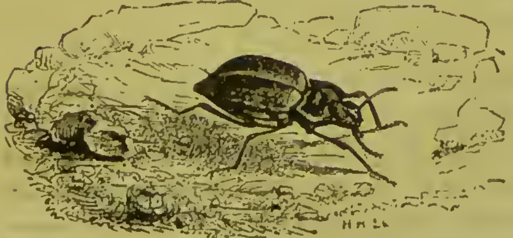
The insects of another genus† have derived their name from their sombre and almost black colour, and the obscure, retired, sandy or humid plains which they frequent. Their gait is lively, and they fly in general tolerably well, but rather in the evening and night, than in the middle of the day. They are usually met with in houses, especially in garrets and kitchens. They conceal themselves in the clefts of wood furniture, or behind tapestry. Their larvæ resemble a scaly worm.

The wire-worm is long, slender, and very tough and hard ; but otherwise it has no resemblance to wire, being whitish in colour, of a flattish form, and jointed or ringed. Its breathing spiracles, two in number, are on the back of its last ring.

TENEBRIO MORTISAGA.

BEETLE OF THE MEAL-WORM (*Tenebrio molitor.*)

People generally seem not to be aware that beetles make their way into the human stomach. Yet there is abundant evidence which proves beyond all controversy that the meal-worm, though its usual food is flour, has often been voided both by male and female patients ; and in one instance is stated to have occasioned death. How these grubs should enter the stomach it is difficult to say ; perhaps the eggs may have been swallowed in some preparation of flour. But that the insect should be able to sustain the heat of this organ, so far exceeding the temperature to which it is usually accustomed, is the most extraordinary circumstance of all.



PIMELIA CORONATA.

LEPTURA MORDAX.

The Pimelia is a species peculiar to Upper Egypt, and is found in the tombs of that country.

The majority of the next genus ‡ occur in Europe ; and Britain produces about a score. Few of them have yet been observed in Scotland, probably owing to a comparative deficiency of wood. Of this genus there are several species.

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* Dermistes.

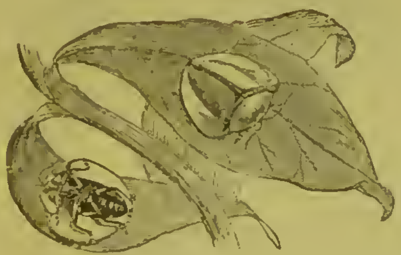
† Tenebrio.

‡ Leptura.

The insects of one genus * are found, for the most part, in forests, in the half-rotten trunks of trees, and in timber-yards, where they are often caught at the moment in which they are issuing forth from the wood in which the larva is nourished. Many species frequent flowers, and live on their nectar.

Another genus † presents an immense number of species. Many are highly ornamental, and present pleasing combinations of green and golden hues, which, however, soon disappear or diminish in intensity after the death of the insect, but may be temporarily restored by the use of hot water. These insects are herbivorous in their habits, and are fond of artichokes and thistles.

The larvæ of numerous insects of the genera *Leptura*, *Callidium*, and many others, as soon as hatched, have their first station between the bark and the wood, and begin to make their way into the solid timber, some of them plunging into the iron heart of the oak. Here the little creature—at its first starting, perhaps, not bigger than a pin's head—eats for itself tortuous paths, gradually increasing in dimensions as the insect increases in magnitude, till it attains in some instances to a diameter of one or two inches. What havoc must thus be made in a beam! Perceval, in his account of Ceylon, says:—"There is an insect found here which resembles an immense overgrown beetle. It is called by us a carpenter, from its boring large holes in timber of a regular form, and to the depth of several feet, in which, when finished, it takes up its habitation." Seeing the perfect insect come out of these holes, an unentomological observer would naturally conclude that the beetle he saw had formed it and lived in it; but, doubtless, the whole was the work of the grub.



TORTOISE BEETLE (*Cassida suturalis*).

CALLIDIUM ARCUATUM.

The destructive powers of such creatures furnished Shakespeare on many occasions with appropriate metaphors. Thus "false caterpillars" is the epithet bestowed by Jack Cade and his "ragged multitude" on their opponents. As the Duke of York reflects on his condition, he says—

"Thus are my blossoms blasted in the bud,
And caterpillars eat my leaves away."

But never is the image employed more fitly or impressively than in King Richard II., when the gardener entering into a colloquy with his attendant on the state of the kingdom says (while the queen, who had entered "to drive away the heavy thoughts of care," becomes a concealed listener to their discourse):—

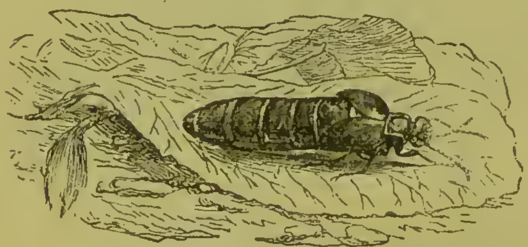
"Why should we in the compass of a pale,
Keep law, and form, and due proportion
Showing, as in a model, our firm estate?
When our sea-walled garden, the whole land,
Is full of weeds; her fairest flowers choked up,
Her fruit trees all unpruned, her hedges ruin'd,
Her knots disorder'd, and her wholesome herbs
Swarming with caterpillars?"

The Spanish-fly or Blister-beetle,‡ well known for its medical uses, stands amidst another large family.§ It is found in France, but in Italy and Spain it appears to be specially abundant. It is of a bright green colour; the antennæ and legs are of a bluish black. When touched, these insects feign death, and emit an odour of a highly penetrating nature.

* Callidium. † Cassida. ‡ Cantharis vesicatoria. § Cantharidæ.

"These beetles, with those of *Mylabris*," says Kirby, "amply make up in efficacy for their numerical insignificance; and almost any article could be better spared from the *Materia Medica* than one of the former, usually known under the name of *Cantharides*, which is not only of incalculable importance as a vesicatory, but is now administered internally in many cases with very good effect." In Europe, the insect chiefly used with this view is the *Cantharis vesicatoria;* but, in America, the *C. cinerea* and *vittata* (which are extremely common and noxious insects, while the *C. vesicatoria* is sold there at sixteen dollars the pound) have been substituted with great success, and are said to vesicate more speedily. In China they have long employed the *Mylabris cichorei*, which seems to have been considered the most powerful vesicatory among the ancients, who appear, also, to have used the *C. vesicatoria.*

The term *Meloe* is restricted to the cantharidæ which are wingless. The species are all beetles, with large and swollen bodies, and short oval wing cases, lapping over each other at the base of the suture. They are sluggish creatures, and feed on various plants, especially the ranunculus. When alarmed, they emit from the articulations of their legs an oily, yellow, or reddish liquid.


OIL BEETLE (*Meloe majalis*).

DIAMOND BEETLE (*Curculio colon*).

A beetle was much talked of by the ancients as injurious to cattle. M. Latreille suspects it to belong to the genus Melöe, which feeds on herbs and on the ranunculi, so widely disseminated in our pastures. It is clear that its name and character were known in Greece; and that such an insect, retaining nearly its own name, and accused of being the same cause of injury to cattle, still exists. Belon informs us that on Mount Athos there is found a winged insect, like the blister-beetle, but yellow, larger, and of a very offensive smell, which feeds on various plants, and is called *Voupristi* by the caloyers or monks, who assert that when horses or other cattle even feed on the herbs which the insects have touched, they die from inflammation, and that it is an immediate poison to oxen. About the precise position of the creature there is, however, still some doubt.

Another genus, * defined by its founder, has been changed, by the progress of Entomology, into a family, including several thousand species. The splendid Diamond Beetle, the wing-cases of which furnish such gorgeous microscopic objects, is a member of the tribe. Many of them are adorned with the most vivid metallic lustre, and some, in intensity and brightness of hue, emulate gems, and have been used for purposes of ornament.

Among the numerous genera and species of this extensive family, distributed widely over the world, are the Weevils. Many of them are dangerous enemies to the agriculturist; destroying grain, fruit, flowers, leaves, and stems, and from their numbers often perpetrating serious mischief.

Another species, which in South America attacks the pith of the palm tree, is also represented. Its larva is called by the colonist *Ver Palmiste*, and is esteemed a delicacy.

The first of the Grain-eaters, which is but too well known in this country, is the Grain Weevil,† the same, probably, of which Virgil speaks:—

"The high stacks of corn
Are wasted by the weevil."

Kirby and Spence calculate that a single pair of weevils may produce, in one season, 6,000 descendants; and they were told by an extensive brewer that he had collected and destroyed them by bushels, meaning, probably, insects and damaged grain together. It is said that when they once secure an entrance into malt-houses, they cannot be entirely destroyed for years.

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* Curculio.

† Calandria granaria.

THE PALM BEETLE (*Curculio palmarum*).

The grub of the Nut Weevil,* like the rest of its congeners, is provided with an instrument for depositing its eggs considerably different from those of the ichneumons and saw-flies. For this purpose the weevil makes use of its long horny beak to drill a hole in filberts and hazel nuts, while in their young and soft state, about the beginning of August. The mother weevil may then be seen eagerly running over the bushes, and it would appear that she always rejects the nuts in which one of her neighbours has previously laid an egg; at least, two grubs are never found in the same nut.

The egg which is thus thrust into the young nut is of a brown colour, and is hatched in about a fortnight; the grub feeding on the interior of the shell, as well as the soft pulp, till the one becomes too hard and the other too dry to be nutritive. It is remarkable that, during this period, he takes care not to injure the kernel, but permits it to ripen before he attacks it. Had he done this prematurely, he would ultimately have been starved, as he has not the power of perforating another nut when the first is consumed.

WEEVILS.

It is said also, that he is very careful to preserve the original hole made by the mother, by gnawing around its inner edges, in order to facilitate his exit, which he effects when the nut falls to the ground in September or October. The hole found in the nut appears much too small to have admitted of the insect's passage; but from being very soft, it no doubt stretches itself out for the purpose, using its short claws as instruments of motion. These facts recall Southey's words:—

"Nay, gather not that Filbert, Nicholas,
There is a maggot there—it is his house—
His castle—oh commit no burglary!
Strip him not naked—'tis his clothes, his shell,
His bones, the case and armour of his life,
And thou shalt do no murder, Nicholas!
It were an easy thing to crack that nut,
Or with thy crackers or thy double teeth,
So easily may all things be destroyed!
But 'tis not in the power of mortal man
To mend the fracture of a filbert shell.
There were two great men once amused themselves,
Watching two maggots run their wriggling race,
And wagering on their speed; but, Nick, to us
It were no sport to see the pamper'd worm
Roll out, and then draw in his folds of fat,
Like to some barber's leathern powder-bag:
Wherewith he feathers, frosts, or cauliflowers
Spruce beau, or lady fair, or doctor grave.
Enough of dangers and of enemies
Hath Nature's wisdom for the worm ordained:
Increase not thou the number. Him, the mouse,
Gnawing with nibbling tooth the shell's defence,
May from his native tenement eject;
Him may the nut-hatch piercing with strong bill
Unwittingly destroy; or to his hoard
The squirrel bear, at leisure to be crack'd."

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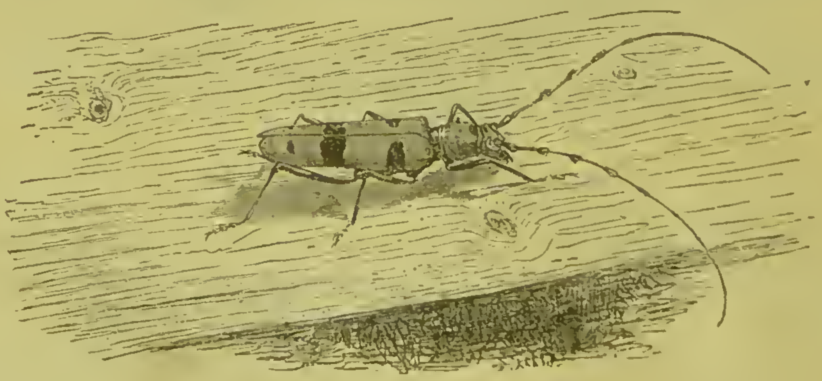
* Balaninus nucum.

"During the autumn," says Salisbury, "we frequently observe a small weevil, busily employed in traversing the branches of apple trees, on which it lays its eggs, by perforating the bloom buds. In the spring, these hatch, and the grubs feed on the petals of the flowers, drawing up the whole flower into a cluster by means of their web. The bloom thus becomes destroyed, and the grub falls to the ground, where it lays itself up in the chrysalide state; and in the autumn afterwards we find the weevil renewed, which again perforates the buds, and causes a similar destruction in the following spring. This weevil is very common in the gardens near London."

CERAMBYX.

Another large family[*] is found in all parts of the globe; their most striking feature being the great length of the antennæ. They appear to assist, with numerous other wood-feeding insects, in the removal of old and decaying trees. The parent insects deposit their eggs in holes excavated for the purpose. When these are hatched the larvæ commence feeding on the wood, and in so doing excavate burrows in various directions, but mostly longitudinal. In this state they live for two or three years, and the perforations they make are very extensive.

The Musk Beetle—which is very common in the south of England, on old pollard willows—is a good illustration of the genus. It is about an inch and a half in length, of an elongate and somewhat linear form; its colour is usually bright green, sometimes blue; the under part of the body is bluish. This insect emits a very strong and agreeable odour, which is not unlike attar of roses; it certainly bears no resemblance to musk, though those who gave it the name of musk beetle appear to have thought it did.


THE MUSK BEETLE.

We add to these a few other beetles. Of one genus[†] we give the Cardinal Beetle (*Pyrochroa coccinea*); of another,[‡] *Attelabus apiarius;* of another,[§] *Brentus anchorago;* of another, *Anthribus latirostris;* and of another,[‖] *Melolontha fullo.*

THE LADY-BIRDS.[¶]

A VERY large and varied family now claims attention; the insects forming it being popularly known as Lady-birds and Puff-ball Beetles. The peasants in France style them, in honour of their useful qualities, *Bêtes à Dieu;* while the English name is a tribute to their beauty.

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[*] Cerambicydæ. [†] Pyrochroidæ. [‡] Attelabides. [§] Brentides. [‖] Melolonthidæ. [¶] Trimera.

The insects of this family are remarkable for brilliant colouring, being generally red or yellow, with black, white, red, or yellow spots. Individuals of the several species are extremely variable and different from each other in their markings. Some have supposed that many of these varieties are hybrids between the sexes of different species; but M. Audouin maintains that the eggs produced from the union of allied species in the genus *Coccinella* are sterile. They creep slowly, but fly well; and many kinds are gregarious. The eggs are deposited in yellow patches among the plant-lice, so that the larva is hatched in the midst of its food. They abound in our fields and gardens, and are among the first beetles which come out in spring. They appear sometimes in immense swarms, and spreading over the field, cause needless alarm to the farmer, to whom, far from being a pest, they are a blessing, from the fierce war they wage against his enemies, the *aphides.* Some of the species are widely distributed, such as the *Coccinella septem punctata*, which extends its range over all Europe, and parts of Asia and Africa. In England we have six genera of *Coccinellidæ*, and more than fifty species.

CARDINAL BEETLE (*Pyrochroa coccinea*).

ATTELABUS APIARIUS.

It may be well, in closing this account of the Wing Sheathed Insects, to advert to the oft-quoted words of Shakespeare—

> "The poor beetle that we tread upon,
> In corporal sufferance finds a pang as great
> As when a giant dies."

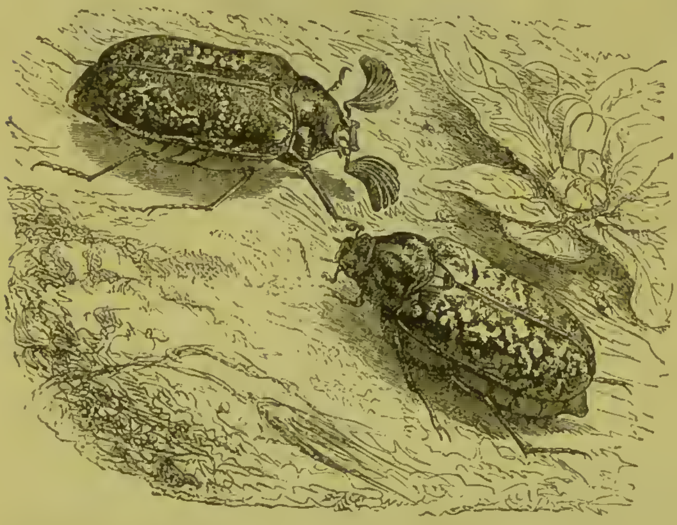
Numerous, indeed, are the observations to which these lines have given rise. It is usually asserted that the poet meant to say, "The corporal sufferings of a giant are great, and those of a beetle when trodden under foot are as great."

BRENTUS ANCHORAGO.

ANTHRIBUS LATIROSTRIS.

If, however, this be so, the entomologist, who kills an insect for his cabinet, occasions the same amount of actual suffering he would do were he to put one of his fellow-creatures to death. But it is not so, as the following facts, which occurred to a relative of the writer's, ardently engaged in entomological pursuits, will sufficiently demonstrate. He picked up in the pleasant village of Lee, near Blackheath, the remains of a stag-beetle, crushed beneath a wheel. The body was gone: he carelessly pulled the head off, and was surprised by the large jaws moving; he took it home with him, and by the slightest irritation of the part which had united it to the body, it continued to move the jaws, and with sufficient force to hold on to his finger by them, twenty-four hours afterwards. On another occasion, at the close of a day's collecting in the Kentish woods, during which he had consigned many captures to a bottle of pure alcohol, he proceeded to pin and arrange his new acquisitions. There was no sign of life; the spirit had even swollen the integuments in some instances, so that the bodies would readily have separated into parts without great care. The next morning, on examining his setting-board, he found the greater portion alive, and endeavouring to free themselves from the pins which confined them.

Here, then, are a few out of a multitude of instances, establishing the extraordinary vitality of insects. Exposed as they are beyond all other animals to innumerable dangers, and the most serious mutilations, it is impossible to conceive that they should be really sensitive. But they are, by a law of Providence, specially appointed to prey on each other, so as to prevent a too extensive increase of the race, and were they not insensible to pain, the whole lives of myriads would be passed in acute torments. Now, this cannot be.


MELOLONTHA FULLO.

THE SEVEN-SPOTTED LADY-BIRD (*Coccinella septem punctata*).

Is Shakespeare, then, wrong in his assertion? No; on the contrary, it furnishes evidence of his profound sagacity. If the context be examined in which it stands, it will be found that the object of the poet was to urge that—

> "The sense of death is most in apprehension,"

not in the act; and that even a beetle, which feels so little, feels as much as a giant does. The less, therefore, the beetle is supposed to feel, the more force is given to the sentiment of Shakespeare, and the more freedom has the entomologist in his favourite pursuits.

NERVE-WINGED INSECTS.*

The superior wings of insects in this order are semi-coriaceous, usually displaying numerous nervures, in a longitudinal direction, and having the interspaces filled up with transverse or reticulated small nervures. The anterior portion of the inferior wings is generally of a different substance from the posterior portion, the nervures are more crowded and in character and often even in colour, it nearly resembles the anterior pair of wings; the hinder portion of these wings is, almost always, more transparent, and when not in use is folded like a fan.

Latreille has divided this order into two sections: the Runners† and the Jumpers.‡

THE EARWIG.§

We begin with the Runners. One family|| contains the Earwigs. They appear to prefer damp situations, and are found under stones and the bark of trees, frequently in abundance. The female sits on her eggs in the manner of a hen, a fact which Frisch appears first to have noticed. De Geer having found an earwig thus occupied, removed her into a box where there was some earth, and scattered the eggs in all directions. She soon, however, collected them, one by one, with her jaws, into a heap, and assiduously sat upon them as before. "This remarkable fact," says Kirby, "I have myself witnessed, having found an earwig under a stone which I accidentally turned over, sitting upon a cluster of young ones, just as this celebrated naturalist has described."

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* Orthoptera. † Cursoria. ‡ Saltatoria. § Forficula auricularia. || Forficulidæ.

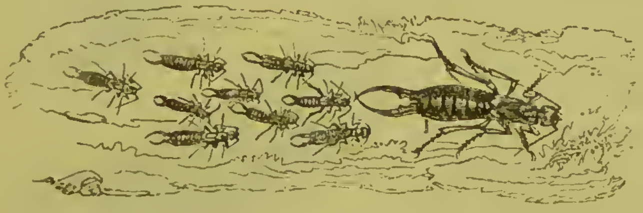
The young ones, which resemble the parent, except in being of a paler colour, and having neither wings nor wing-cases, creep, as soon as they are hatched, under the body of the mother for protection. The wings of the earwig are transparent, of large size, and when expanded, shaded like a fan. The principal nervures radiate from one point near the anterior margin. These organs, when not in use, are folded beneath two small horny wing-cases, and hence, to the common observer, the insect appears wingless.

The male and female earwig differ considerably in their anal forceps; those of the female being less curved, and destitute of a tooth-like process, which is observed on the inner side at the base of the forceps of the male.

There is in this country another species of earwig, almost equally common with that we have just noticed, but which is of a much smaller size. It is found about hot-beds and dunghills, and differs from the common earwig somewhat in its habits, as well as in its structure. This belongs to another genus.*

THE EARWIG (*Forficula auricularia*).

We may remark, in passing, that it is an unfounded popular prejudice that earwigs get into the brain by creeping into the ear; for though, from being night insects, and disliking exposure to light, they may, by chance, attempt to take shelter in the ear, the disagreeable odour of wax would soon drive them out; at all events, they could never get further than the drum. A small beetle has been known to get into the ear, but it did no further injury than produce a strange tingling sensation, by crawling about the drum, and soon made its exit.


THE EARWIG AND HER YOUNG.

THE COCKROACHES.†

These insects form another family of this order (*Orthoptera*), of which there are several species. The well-known and troublesome Cockroach ‡ is said to have come originally from Asia; but this is doubtful. Its nocturnal habits and ravages are well known. The male, in its mature state, has wings extending only half the length of the body; the female has only rudimentary wings.

The eggs of these insects, to the number of sixteen, are inclosed symmetrically in an oval compressed shell, at first white, and afterwards brown, tolerably solid, and toothed at its edges like a saw. The female carries it about for some time, and afterwards attaches it to some favourable position by a gummy exudation. From this asylum the young make their escape by emitting a fluid which softens part of the case.

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* Labia.

† Blattidæ.

‡ Blatta Orientalis.

The common cockroach is about an inch long, and of a reddish, chesnut, brown colour.

The number of exotic species of this tribe is very great. Some are very small, and are found in woods; and one is said to swarm in the huts of the Laplanders, where it commits great havoc, and, in conjunction with another insect,* has been known to devour their whole supply of dried fish in a single day.

In London, and many other parts of the country, cockroaches have multiplied so prodigiously as to be a very great nuisance. So numerous have they been in kitchens, and other lower rooms in the metropolis, as literally to cover the floor, and render it impossible for them to move except over each other's bodies. This, indeed, happens only after dark, for these are strictly night-insects, and the instant a candle disturbs them, they rush towards their hiding-places, and in a few seconds not one of the countless multitude is to be seen. In consequence of their numbers, independently of their carnivorous propensities, they eat everything which comes in their way; and, besides devouring every species of kitchen stuff, they gnaw clothes, leather, and books. These black beetles, as they are commonly called, are harmless when compared with a foreign cockroach,† which, not content with devouring the stores of the larder, will attack human bodies, and gnaw the extremities of the dead and the dying.

A recent writer says:—

"Although cockroaches abounded inconveniently at the Mauritius, it was not without pity that I saw them consigned, as they frequently were, to a living grave, by a wicked-looking insect much resembling a Spanish fly. It was impossible to witness his proceedings, combined with his glittering blue and green dress, without imagining the elfish demon of a pantomime leading an innocent victim to a perpetual entombment in a haunted cavern. Let the cockroach be moving never so briskly across the wall, he has no sooner caught sight of the fatal insect—not a quarter his size—than all energy leaves him, and he stands stupidly resigned. The fly then walks up to him, looks him hard in the face, and presently, putting forth some apparatus, which stands him in place of a finger and thumb, gently takes the cockroach by the nose, and leads him daintily along for a foot or two. Leaving him there, he commences a thorough examination of the neighbourhood, beating the ground up and down like a well-trained setter, and, not finding what he wants, returns to the cockroach and leads him on a little further, when the same process is gone through, sometimes for hours, until the whole wall has been examined. Chinks there are in plenty, but they do not suit him. He has taken the measure of the victim's bulk, and means to lodge him commodiously. Presently a suitable hole is found, and the fly, moving backward, gently pulls the cockroach after him into his last home. What horrors are perpetrated in this dark recess cannot be more than surmised. The object, undoubtedly, is to engage him as a wet nurse. No doubt the poor cockroach is bored in some part not vital, and eggs laid in him—a purpose, indeed, for which his succulent and motherly frame seems peculiarly adapted. And, not improbably, during this vicarious incubation, he is supplied with food, until the young of whom he is pregnant being hatched, commence, in return for his services, to 'gnaw his bowels, their repast.' It is in vain that, during the scene above described, you urge the cockroach to seek safety by flight. The poke of a stick is disregarded; he seems dead to all hints; nay, move him to another part of the wall, he awaits there, with the same stolid indifference, the return of his tormentor. Probably a sly thrust is given him in the first meeting of noses, or some 'leprous distilment' dropped into his ear, for he has entirely the air of being hocussed."

COCKROACHES.

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* Silpha Lapponica.

† Blatta gigantea.

Another family* found in all warm countries, are exceedingly numerous, and remarkable for the grotesque forms they usually assume.

THE PRAYING MANTIS.

The singular form, and particularly the attitudes of this insect, have given rise to several superstitions. "They are called mantes, that is, fortune-tellers," says Mouffet, "either because by their coming (for they first of all appear) they do show the spring to be at hand, so Anacreon, the poet, sang; or else they foretell death and famine, as Cælius, the scholiast of Theocritus, writes; or lastly, because it always holds up its fore feet like hands, praying, as it were, after the manner of their diviners, who, in that gesture, did pour out their supplications to their gods. So divine a creature is this esteemed, that if the childe aske the way to such a place, she will stretch out her feet and show him the right way, and seldome or never misse. As she resembleth those diviners in the elevation of her hands, so also in likeness of motion; for they do not sport themselves as others do, nor leap, nor play, but walking softly, she retains her modesty, and showes forth a kind of mature gravity."

MANTIS RELIGIOSA.

The attitude, however, which has obtained for the insect the name of Praying Mantis (*Prie Dieu*, in France) is nothing more than the posture in which it patiently lies in wait for its prey; for having once set its eyes on an insect, it rarely loses sight of it, though it may require some hours before it can make a capture. Should the creature be overhead, and beyond its reach, it slowly erects its long, neck, and elevates itself on its hind legs. If this bring it within reach, it throws open the last joint of its fore paws and snaps the insect between the spines, set in rows on the second joint. Should it prove unsuccessful, it does not retract its paws, but holds them stretched out, and waits again til the insect is within its reach, when it springs up and seizes it. Should the insect go far from the spot, it flies or crawls after it slowly on the ground, like a cat; and when the insect stops, it erects itself as before.

These creatures may be described as cannibal insects; and they show their savage habits in the earliest stage of their existence. Their eggs are placed in an oblong bag, of a thick, spongy, imbricated substance, and fastened lengthwise to the branch of a plant. Rosel being desirous of observing the development of the insects, placed one of these egg-bags in a close glass, into which, when the young appeared, he put different sorts of plants. But vegetable food not suiting their taste, they preyed upon one another. This determined him to supply them with insect food, and he accordingly put several ants into the nurse-glass. Then, however, they betrayed as much cowardice as they had previously showed barbarity; for the instant the ants were observed, the mantes attempted to escape in every direction, evidently from instinctive fear of a natural enemy. Afterwards, he tried them with some of the common house-flies, and these they seized with eagerness, and tore to pieces. But notwithstanding their apparent fondness for flies, they continued to destroy each other through savage wantonness. Rosel, despairing at last, from their daily decrease, of rearing any to the winged state, separated them into small parcels, in different glasses; but here, as before, the strongest of each community destroyed the rest.

The fore-legs of these insects resemble somewhat a sabre in form; and they can as dexterously cleave their antagonist in two, or cut off his head at a stroke, as the most expert Life Guardsman. In this way they often treat each other, even the sexes fighting with the most savage animosity. M. Pairet put a male and female mantis into a glass, when the female instantly made an attack on her companion, seized him between the sharp points of her claws, and with these she soon cut off his head. As these insects are very tenacious of life, he appeared to continue lively for a considerable time; but the female ended by devouring him.

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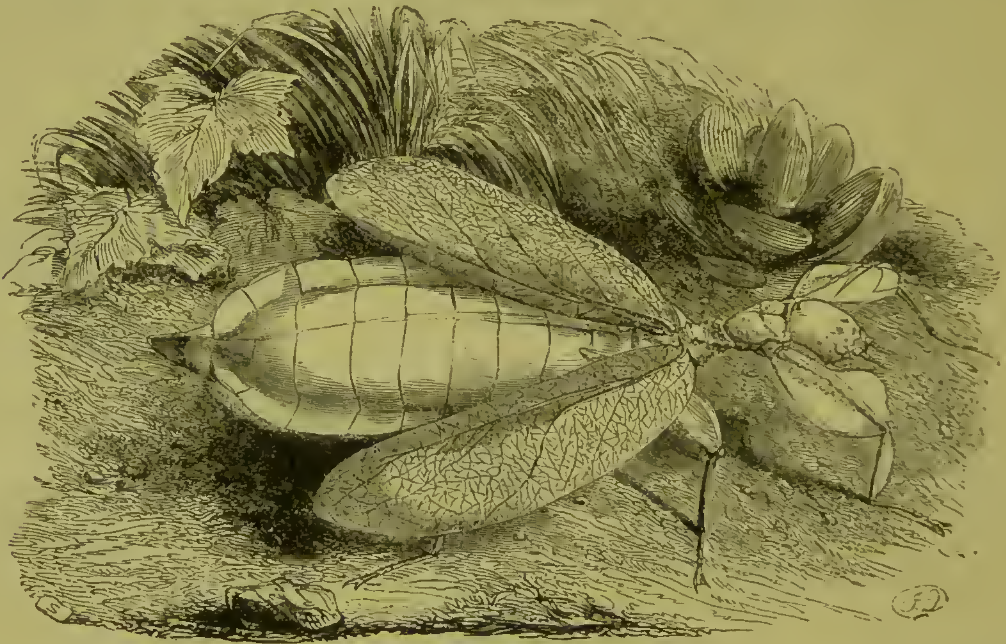
* Mantidæ.

WALKING-LEAF INSECTS.*

A TRIBE of exotic insects embraces a number of forms often included among those just described, but from which they are distinguished by the fore-legs being of the ordinary size, and fitted like the rest for walking rather than running.

The odd appearance of these insects has obtained for them the names of Leaves, Spectres, Straws, and Walking-sticks; and certainly nothing can be imagined more curious than the forms they assume. Thus, some appear like walking leaves, and others might be mistaken for a portion of the branches of the trees on which they rest.



WALKING-LEAF INSECT.

"I have," says Mr. Kirby, "one of the spectre tribe from Brazil, eight inches long, and unless it were seen to move, it could scarcely be conceived to be anything but a small branch with its spray; the legs, as well as the head, having their little snags and knobs, so that no imitation can be more accurate. Perhaps this may be the species mentioned by Molina, which the natives of Chili call 'The Devil's Horse.'" This conjecture proved to be correct; for after these words were published, a lady from the West Indies, looking at Mr. Kirby's cabinet, upon being shown this insect, exclaimed, "Oh! that is the Devil's Horse."

A very surprising instance of the adaptation of the colour of some insects to that of the soil where they reside, is found in some of the Mantis tribe. M. Lefebvre met with these insects, in the pupa state only, in the very midst of the African desert, leading to the oasis of Bahryah, about four days' journey from the Nile, where he could not discover the slightest trace of any other insect or substance on which they could by possibility feed, but apparently passing a life of absolute solitude in the midst of these burning sands. They had the most perfect identity of colour with that of the soil on which they were found, being brown where the soil was brown, and, at not above a hundred paces distant, of a silvery white, when found amongst the white particles of broken shells or calcareous rocks of a similar dazzling colour. That it was the same species which exhibited this change of colour, M. Lefebvre did not doubt; nor that the object was its protection from its enemies, which it was so well calculated to effect that he could scarcely detect it by the closest inspection; but he confesses himself unable to explain whether the different coloured insects were confined to the soils of the same tints respectively, or, as in the case of the birds and quadrupeds which become white in winter in the Polar regions, they had the faculty of changing their colour as they change their abode.

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* Phasmidæ.

The terms Locust and Grasshopper are applied to various insects of the present order, and belong to Latreille's section of Jumpers,* being remarkable for the great size of the thighs of the posterior pair of legs, which are generally very long, and adapted for leaping. In the locusts the hinder legs are about equal to the whole body in length. The section may be divided into three families:—the Crickets,† the Locusts,‡ and the Grasshoppers.§

THE COMMON HOUSE CRICKET.||

This insect is found throughout Europe; it frequents houses, and prefers the vicinity of fires. The address of the poet to this creature is very pleasing:—

"Little inmate, full of mirth,
Chirping on my kitchen hearth,
Wheresoe'er be thine abode,
Always harbinger of good,
Pay me for thy warm retreat,
With a song more soft and sweet;
In return thou shalt receive
Such a strain as I can give.

"Thus thy praise shall be express'd,
Inoffensive, welcome guest!
While the rat is on the scout,
And the mouse with curious snout,
With what vermin else infest
Every dish, and spoil the best;
Frisking thus before the fire,
Thou hast all thy heart's desire.

"Though in voice and shape they be
Form'd as if akin to thee,
Thou surpassest, happier far,
Happiest grasshoppers that are;
Theirs is but a summer's song,
Thine endures the winter long,
Unimpair'd, and shrill, and clear,
Melody throughout the year."

The celebrated naturalists, Linnæus and Bonnet, were disposed to consider insects as deaf; but the knowledge of Shakespeare was more accurate when he made Mamilius say,

"I will tell it softly,
Yon crickets shall not hear it"

As soon as it becomes dark, the chirping of crickets increases, and they come running forth, often in great numbers, from the size of a flea to that of their full stature.

The instrument on which the male plays consists of strong nervures, or rough strings in the wing-cases, by the friction of which against each other a sound is produced and communicated to the membranes stretched between them, in the same way that the finger produces vibrations on a tambourine, which are diffused over its surface.

To most people, the chirp of the cricket conveys to the mind the idea of a perfectly happy being. Thus, to the Prince's question, "Shall we be merry?" Poins answers "As merry as crickets." The learned Scaliger took such a fancy to their song, that he was accustomed to keep them in a box in his study. Osbeck states that the Spaniards confine some insects of an allied genus, in cages, for the sake of their song, and in some parts of Africa, it is said, the common house crickets are kept and fed in a kind of iron oven, and sold to the natives, who like their chirp, and consider it a great sporific.

On one occasion, according to Southey, the song of an insect of this genus was the means of saving a vessel from shipwreck. The incident occurred in the voyage of Cabeza de Vara towards Brazil:—"When they had crossed the Line, the state of the water was inquired into, and it was found that of a hundred casks there remained but three, to supply four hundred men and thirty horses. Upon this, the Adelantado gave orders to make the nearest land. Three days they stood towards it. A soldier, who set out in ill-health, had brought a grillo, or ground cricket, with him from Cadiz, thinking to be amused by the insect's voice; but it had been silent the whole way, to his no little disappointment. Now, on the fourth morning, the grillo began to sing its shrill rattle, scenting, as was immediately supposed, the land. Such was the miserable watch that had been kept, that upon looking out at the warning, they perceived high rocks within bow-shot, against which, if it had not been for the insect, they must inevitably have been lost. They had just time to drop anchor. From hence they coasted along, the grillo singing every night, as if it had been on shore, till they reached the island of St. Catalina."

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* Saltatoria. † Gryllidæ. ‡ Locustidæ. § Acridiidæ. || Gryllus domesticus.

Like many noisy persons, crickets like to hear nobody louder than themselves. Ledelius relates that a woman, who had tried in vain every method she could think of to banish them from her house, at last got rid of them by the noise made by drums and trumpets, which she had procured to entertain her guests at a wedding. They instantly forsook the house, and she heard of them no more.

THE FIELD CRICKET.*

The House Cricket does not pass its entire existence about our hearths. Like other denizens of the town, it delights occasionally to take an excursion during the summer, and at such times may be heard singing its vesper song in company with the field cricket. "Sounds," says Gilbert White, "do not always give us pleasure according to their sweetness and melody, nor do harsh sounds always displease. Thus, the shrilling of the field cricket, though sharp and stridulous, yet marvellously delights some hearers, filling the mind with a train of summer ideas, of everything that is rural, verdurous, and joyous."

FIELD CRICKETS.

Brunelli, an Italian naturalist, kept several field crickets in a chamber. They continued their crinking song through the whole day, but the moment they heard a knock at the door they were silent. He subsequently invented a method of imitating their sounds, and when he did so outside the door, at first a few would venture on a soft whisper, and by-and-by, the whole party burst out in chorus to answer him; but on repeating the rap at the door, they instantly stopped again, as if alarmed. He likewise confined a male in one side of his garden, while he put a female in the other at liberty, which began to leap as soon as she heard the crink of the male, and immediately came to him—an experiment which Brunelli frequently repeated with the same result.

THE MOLE CRICKET.†

The Mole Cricket, or Common Fen Cricket, is formed like the ordinary one. The length of its body is about one inch, divided into three portions; its colour is of a reddish brown, the middle portion being of a greyish velvety brown; two horizontal wings issue from the latter part, which prolong themselves into fillets beyond the wing-cases to the posterior extremity of the body. In Fig. A. the anterior legs are widened and terminated by five toes, one of which forms a large star. Fig. B. represents one of these legs magnified three times. Thus resembling a hand, and used to dig, the creature is called, from its resemblance to a well-known animal, the mole cricket. Its skin being covered with a fine down, effectually prevents the adhesion of the moist earth through which it moves, and it has a form of body enabling it to penetrate with least resistance the opposing medium. By being endowed with the power of moving as easily in a backward as a forward direction, it is enabled quickly to retreat in the narrow channel it has excavated; and, as a safe-guard in these retrograde movements, it is provided with a pair of posterior appendages, which are supplied with large nerves, and may be regarded as serving the purpose of caudal antennæ. Comparing the fore-legs with the others, and with the general size of the animal, they are as if the brawny hand and arm of a robust dwarf were set on the body of a delicate infant; and the indications of strength which their structure manifests fully answer to their extraordinary size.

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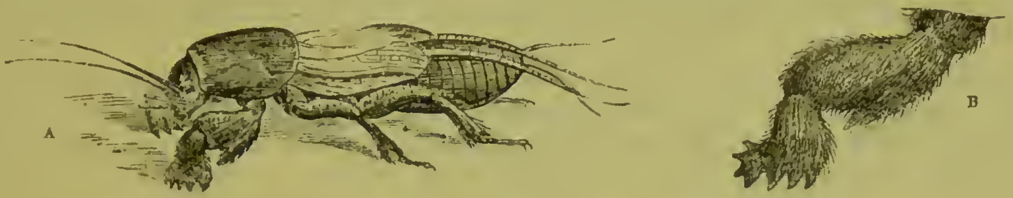
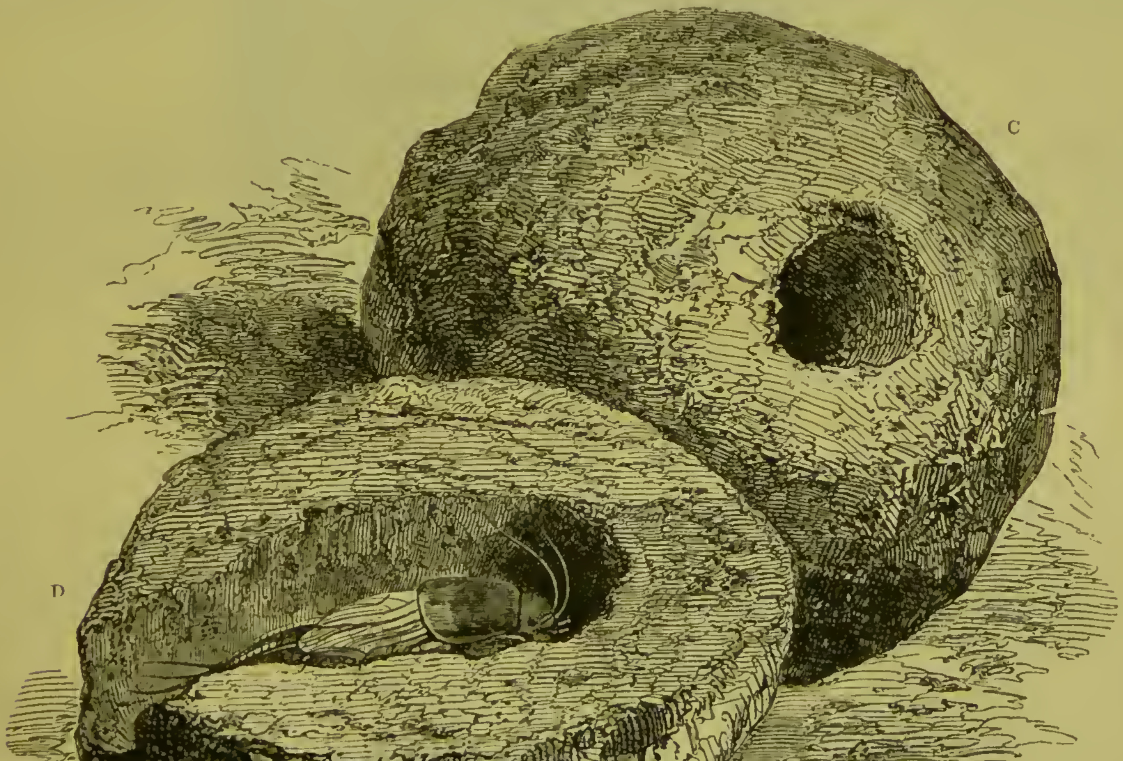
* Acheta campestris.

† Gryllotalpa vulgaris.



A, COMMON MOLE CRICKET. B, ANTERIOR LEG THREE TIMES MAGNIFIED.



C, NEST OF THE MOLE CRICKET. D, INTERIOR OF THE NEST.

This species lives underground, and only emerges into the open air at rare intervals, chiefly at night, and during dry weather. Their abodes consist of a certain number of galleries, which diverge irregularly from a central cavity, communicating with the outside by a small aperture. These galleries are smooth in their interior, and are about a quarter of an inch in diameter. It is in the central cavity that the mole cricket retires, and remains immovable during the entire winter; it is also there where the female lays its eggs.

The laying takes place in the spring, when the male chirps somewhat like the common cricket, but not so piercingly. The young ones are white; gradually, however, they become brown, and assume their natural colour, from which period their resemblance to the adults is complete, differing only from them by the absence of wings.

Around the central point of the abode of a mole cricket, the earth is generally more heaped up than in the more distant points; so that the presence of a nest may easily be known by an earth-heap, which stands out from the surrounding soil. One engraving shows the entire nest, with the aperture of issue; another the interior of the nest.

The galleries and the central cavity are not very deep; they scarcely exceed the extremity of the roots of kitchen garden plants, of small dimensions. In some instances, however, they have been found as deep as eighteen inches. The galleries are generally less deep than the cavity of the centre; they are even frequently known on the surface of the soil, by small longitudinal elevations of earth, which follow their direction.

The mole-cricket digs itself these various subterranean spaces, making use of its hind-legs, admirably adapted to the purpose. Somewhat like the mole, it cuts through the earth by throwing it aside, and partly raising it, by causing the small superficial elevations to which allusion has been made. It accomplishes its purpose notwithstanding formidable obstacles.

THE LARGE GREEN GRASSHOPPER.*

THIS is one of the largest and most conspicuous, both for size and song, of our native grasshoppers; he has rather a sharp head, large prominent eyes, ample wings, and slender antennæ as long as the body. This noble of his tribe is not an unfrequent resorter to hedges and marshy places; and though his green armour may easily escape notice, his loud chirping can hardly fail to attract attention, especially in the songster's months of August and September. Many kinds of grasshoppers are the brethren of this grandee.

Wordsworth has not passed unheeded the

> "———— ———— jocund voice
> Of insects chirping out their careless lives
> On these soft beds of thyme-besprinkled turf."

But of the grasshopper it is said—

> "He is an evening reveller, who makes
> His life an infancy, and sings his fill."

Some grasshoppers were great favourites with the ancients, who often kept them in cages for the sake of their song. They were supposed to be perfectly harmless, and to live on dew. One poet calls the grasshopper "the nightingale of the nymphs;" and another styles it "the sweet prophet of the summer." So attached were the Athenians to some of these insects, that they fastened golden images of them in their hair; and addressed them in the most endearing terms; and from this we may gather that their notes were sweet. Indeed, the sounds of them and of the harp were called by one and the same name.

The auger, as Reaumur calls it, of the cicada, which some improperly style the grasshopper, is composed of a horny substance, and lodged in a sheath, which lies in a groove of the last ring of the belly. A slight pressure brings it forth, when it appears to be of equal thickness throughout, except at the point, where it is somewhat enlarged and angular, and has fine teeth on both sides. The sheath is composed of two horny pieces slightly curved, and ending in the form of a long spoon, so that the concave or hollow part may receive the convex or rounded end of the ovipositor.

On examining this instrument with a microscope, there will appear nine strong teeth on each side, placed very regularly, and becoming finer towards the point, where there are three or four very small ones. Simple as it seems, it is composed of three pieces, two outer, armed with the teeth before mentioned, which Reaumur denominates files, and another pointed like a lancet, and not toothed. The former can be moved backwards and forwards, whilst the latter remains fixed, and the means by which the three pieces are held united, while the files can easily be put in motion, are most exquisitely contrived. Beside the muscles necessary for the movement of the files, the handle of each ends in a curve of the same hard substance as itself, which not only supplies the muscles with a sort of lever, but serves to press, as with a spring, the two files close to the central piece.

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* Acrida viridissima.

"In our male grasshoppers," says De Geer, "in that part of the right elytrum which is folded horizontally over the trunk, there is a round plate made of very fine transparent membrane, resembling a little mirror, or piece of talc, of the tension of a drum. This membrane is surrounded by a strong and prominent nervure, and is concealed under the fold of the left elytrum, which has also several prominent nervures answering to the margin of the membrane. There is," he further remarks, "every reason to believe that the brisk movement with which the grasshopper rubs these nervures against each other produces a vibration in the membrane, augmenting the sound. The males in question sing continuously in the hedges and trees, during the months of July and August, especially towards sunset, and part of the night; when any one approaches, they immediately cease their song."

THE GRASSHOPPER.

In these insects, as in the crickets, M. Goureau has detected in the strong horny ridge immediately behind the mirror or tympanum, near the base of the upper surface of the left elytrum, the same transverse notches as in *Acrita* and *Grillotalpa*, while on the under surface of the right elytrum a similar but less strongly notched, file-like ridge is found; and it is obviously by the rubbing of these rasps against the projecting nervures of the borders of the wings, that the sounds resulting from the brisk friction of the elytra proceed.

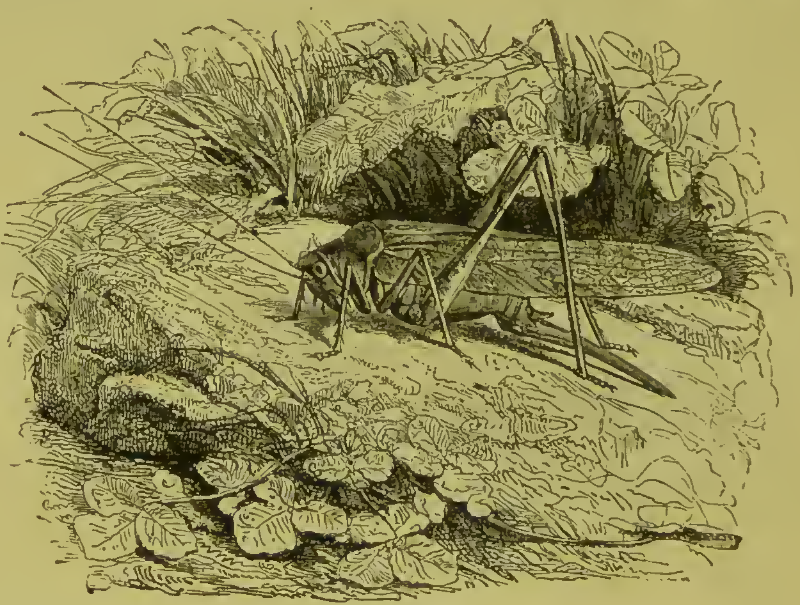
Dr. Burmeister conceives that they are chiefly caused by the forcible expiration of air from the thoracic tracheæ and spiracles, first driven against the inflected external margin of the wing, and subsequently against the tympanum, which is thus caused to vibrate and resound. But Mr. Newport has pointed out that this cannot be the cause, because in *Acrida brachelytra* the elytra are so exceedingly short and narrow that they do not cover, nor are ever any part of the spiracles: so that the air in passing from these orifices cannot possible be driven against the tympanum, which, however, being accompanied by notched nervures, as in *A. viridissima*, though differently arranged, produces similar sounds. A still further proof that these notched nervures or files are the main agents in producing the sounds, is afforded by the facts that their notches are more distinct in newly disclosed specimens than in older individuals, in which they have been partially obliterated by use; and that the sounds, as M. Goureau has remarked, may be readily produced in the dead insect by gently rubbing the bases of the elytra together, which could not happen if the rushing of the air from the spiracles had any effect in producing them.

As, however, it is essential that the males of the *Cicadæ* should so much exceed all others in the loudness of their tones, they are furnished with a much more complex, and, indeed, most wonderful apparatus. "The great Creator," says Kirby, "has placed in these insects an organ for producing and emitting sounds, which, in the intricacy of its construction, seems to resemble that which He has given to man and the larger animals for receiving them. Here is a *cochlea*, a *meatus*, and, as it should seem, more than one *tympanum*."

THE LOCUSTS.

THESE creatures form a large family* in which the hinder legs are about equal to the whole body, and the antennæ filiform, or terminated in a club. Mr. Stephens has enumerated more than twenty species of one genus.†

To this group belongs a large species‡ which has been occasionally found in Britain, and which, in some parts of Europe, multiplies to such a degree as to devastate large districts. Africa at all times appears to have been particularly subject to their ravages. Mr. Barrow states that in the southern parts of Africa an area of nearly two thousand square miles might be said to be literally covered with them.



THE GREEN LOCUST.

The observations of a past century had shown the inhabitants of Pennsylvania and Maryland that every seventeenth year they were visited by a countless horde of insects of the *Cicada* tribe, hence called *septendecim*,§ distinct in aspect and habits from those whose annual appearance and mode of life were well understood. Though of a different tribe, and with perfectly different habits from the locusts of the East,|| the fact of its occasional appearance, as though by magic, in such vast swarms, had caused it to be familiarly alluded to by that name. Its last appearance had been in 1817, and its re-appearance was thus confidently predicted for the third or fourth week in May in the year 1834.

Nature, true to her impulses and the laws by which she is so mysteriously governed, did not fail to fulfil the prediction. On the 24th of May and following day, the whole surface of the country in and about the city of Philadelphia suddenly teemed with this singular insect. "The subject interested me," says Mr. La Trobe, "and as during these days I had every opportunity of being daily, I may say hourly, attentive to the phenomena connected with it, both here and in Maryland, I send you the result of my observation.

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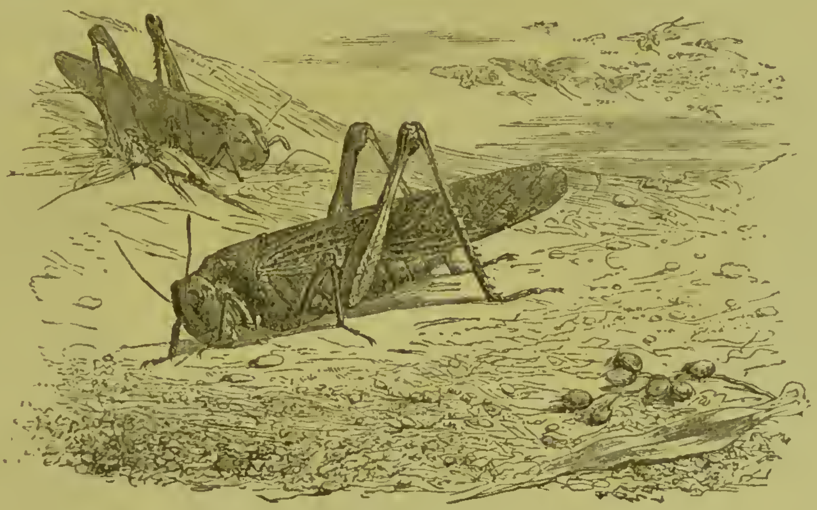
* Locustidæ. † Locusta ‡ Gryllus migratorius. § Tettigonia septendecim. || Gryllus migratorius.

"The first day of their appearance their numbers were comparatively few, the second they came by myriads; and yet a day or two might pass before they reached their full number. I happened to be abroad the bright sunny morning which might be called the day of their birth. At early morning the insect, in the pupa state, may be observed issuing from the earth in every direction, by the help of a set of strongly-barbed claws on the fore-legs. Its colour is then of a uniform dull brown, and it strongly resembles the perfect insect in form, excepting the absence of wings, ornament, and antennæ. The first impulse of the imperfect insect, on detaching itself from its grave, is to ascend a few inches, or even feet, up the trunks of trees, at the foot of which their holes appear in the greatest number, or upon the rail fences, which are soon thickly spread with them. In these positions they straightway fix themselves firmly by their barbed claws. Half an hour's observation will then show you the next change which is to be undergone. A split takes place upon the shell, down from the back of the head to the commencement of the rings of the abdomen, and the labour of self-extrication follows. With many a throe and many a strain, you see the tail and hind legs appear through the rent; then the wings extricate themselves painfully from a little case in the outer shell, in which they lay exquisitely folded up, but do not yet unfurl themselves; and lastly, the head, with its antennæ, disengages itself, and you behold before you the new-born insect freed from its prison. The slough is not disengaged, but remains firmly fixed in the fibres of the wood; and the insect, languidly crawling a few inches, remains, as it were, in a doze of wonder and astonishment. It is rather under an inch in length, and appears humid and tender; the colours are dull, the eye glazed, the legs feeble, and the wings, for a while after they are opened, appear crumpled and unelastic. All this passes before the sun has gained his full strength. As the day advances, the colours of the insect become more lively; the wings attain their full strength, and the body dries, and is braced up for its future little life of activity and enjoyment.



THE MIGRATORY LOCUST.

"Between ten and eleven the newly risen tribes begin to tune their instruments; you become conscious of a sound, filling the air far and wide, different from the ordinary ones which may meet your ear. A low distinct hum salutes you, turn where you will. It may be compared to the simmering of an enormous caldron; it swells, imperceptibly changes its character, and becomes fuller and sharper; thousands seem to join, and by an hour after mid-day, the whole country far and wide rings with the unwonted sound. The insects are now seen lodged in or flying about the foliage above; a few hours having been thus sufficient to give them full strength and activity, and bring them into full voice.

"The pretty insect, for it is truly such, with its dark body, red eyes, and its glassy wings interlaced by bright yellow fibres, enjoys but a little week; and that merry harping which pervades creation from sunrise to sundown, for the time of its continuance, is but of some six days' duration. Its character would be almost impossible to describe, though it rings in my ears every time I think of the insect. Like all those of its tribe, the sound produced is not a voice, but a strong vibration of musical chords produced by the action of internal muscles upon a species of lyre or elastic membrane, covered with net-work, and situated under the wings, the action of which I have often witnessed. The female insect may utter a faint sound, but how I do not know; it is the male who is endowed with the powerful means of instrumentation which I have described. Though the sound is generally even and continuous as long as the insect is uninterrupted, yet there is a droll variety observable at times; but what it expresses, whether peculiar satisfaction, or jealousy, or what other passion, I cannot divine. It has been well described by the word *Pha—ro*, the first syllable being long and well sustained, and connected with the second, which is pitched nearly an octave lower, by a drawling *smorzando* descent.

"During the whole period of their existence, the closest attention does not detect their eating anything; and, with the exception of the trifling injury received by the trees, consequent upon the process observed by the female in laying her eggs, which I will describe immediately, they are perfectly innoxious. The end for which they seem to be sent to the upper day is purely confined to the propagation of their species. A few days after their first appearance, the female begins to lay her eggs. She is furnished with an ovipositor situated in a sheath on the abdomen, composed of two serrated hard parallel spines, which she has the power of working with an alternate perpendicular motion. When her time comes, she selects one of the outermost twigs of the forest trees or shrubs, and sets to work and makes a series of longitudinal jagged incisions in the tender bark and wood. In each of these she lays a row of tiny eggs, and then goes to work again. Having deposited to her heart's content, she crawls up the twig a few inches yet farther from the termination, and placing herself in a fitting position, makes two or three perpendicular cuts into the very pith. Her duty is now terminated. Both male and female become weak, the former ceases to be tuneful; the charm of their existence is at an end; they pine away, become blind, fall to the ground by myriads, and in ten or fifteen days after their first appearance they all perish. Not so, however, their seed. The perforated twigs die, the first wind breaks them from the tree, and scatters them upon the ground. The eggs give birth to a number of smaller grubs, which are thus enabled to attain the mould without injury; and in it they disappear, digging their way down into the bosom of the earth. Year goes after year, summer after summer, the sun shines in vain to them; they 'bide their time!' The recollection of their existence begins to fade, a generation passes away: the surface of the country is altered, lands are reclaimed from the forest, streets are laid out and trampled on for years, houses are built, and pavements hide the soil.

"Still, though man may almost forget their existence, God does not. What their life is in the long interval none can divine. Traces of them have been found in digging wells and foundations eight and ten feet under the surface. When seventeen years have gone by, the memory of them returns, and they are expected. A cold wet spring may retard their appearance, but never, since the attention of man has been directed to them, have they failed; but at the appointed time, by one common impulse, they rise from the earth, piercing their way through the matted sod, through the hard trampled clay of the pathways, through the gravel, between the joints of the stones and pavements, and into the very cellars of the houses; like their predecessors, to be a marvel in the land, to sing their blithe song of love and enjoyment under the bright sun, and amidst the verdant landscape; like them to fulfil the brief duties of their species, and close their mysterious existence by death.

"I may still mention that I took care to ascertain that all these insects sung in one uniform musical key, and that this key was *c* sharp."

Of one genus * we have many species in this country. They are all small. The largest and most beautiful † is about one-third of an inch in length; black; the upper wings are obscure, and have each two large red spots, one at the base and another in the middle. This species is found on the herbage in woods.

THE CUCKOO-SPIT FROG-HOPPER.‡

Who has not noticed, about the time of the cuckoo's welcome advent, the leaves of hawthorn, hazel, woodbine—the leaves, in short, of almost every common shrub and plant in hedge and garden—beginning to be sprinkled with frosty masses, which they know, probably, by the familiar name of "cuckoo-spit?" If, however, they would enter on an examination for themselves, they would find embedded in the centre of each frothy mass a little green, black-eyed insect, from whose body the froth is no other than a secretion, intended, it seems, to cover and protect its wingless infancy.

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* Cercopis.

† C. vulnerata.

‡ Cicada spumaria.

If removed by violence, this frothy veil is gradually renewed; but as its little wearer approaches maturity, it becomes lessened and thinner. Then is the time, if we wish to acquire from this little creature some slender notion of his comparatively gigantic relation, the *Cicada*, to pluck him, with leaf and branch from his native tree, and set him under a glass for careful inspection. The veil of froth having shrunk to a film, we shall then discern, as each part of the insect emerges from a previous skin, first, a large, flat, frog-shaped head, with eyes set wide apart; then a triangular neck or shoulder piece, flanked by small protuberances; and lastly, a short annulated body, pointed at the extremity. Six legs, of which the hinder pair, more strong and healthy than their fellows, bespeak a leaping power, will complete, to all appearance, the somewhat grotesque figure of the little tree-hopper, or frog-hopper, as he is more generally called.

But though thus unveiled and uncased—his skin, perfect even to the legs, left behind him in silvery emptiness, like a shadow of his former self—we must wait a little longer before he will actually have reached his perfect state. He lacks not wings, only his wings want expansion; but, after about ten minutes, occupied in unfolding from the little protuberances which now encase them, there will appear, in readiness for flight, two large transparent pinions, defended outwardly by a pair of less delicate texture. When the latter have put on their colours, most often variegated brown and white, the insect will afford, in an agile spring, half-flight, half-leap, an ocular demonstration of the fitness of its name.

The male tree-hopper, *Cicada*, has a curious instrument of sound. He is furnished with a pair of drums, one on each side, consisting of two large plates, oval or circular in some, and triangular in other species, fixed to the trunk between the belly and the hind legs. When this exterior membrane is raised, a cavity is brought into view, a part of which seems to open into the belly, and another part to be covered with a second membrane, much more delicate than the exterior one, tensely stretched, and iridescent, and in the middle there is a horny plate, placed horizontally along the bottom. All this, however, seems only a secondary portion of the instrument; for the sound is in the first instance produced by a bundle of muscular strings, which are attached at one extremity to another membrane in the interior, obviously the true drum; for when Reaumur pulled the strings, and let them go again, the sound was produced, even after the insect had been a long while dead. These muscles, indeed, are so attached to the under concave surface of the drum, that when they pull it downwards, and let it jerk quickly back again, a vibration is produced; the sound issues through an opening contrived on purpose, like the opening in our own larynx, or the sound-hole in a violin.

HALF-WINGED INSECTS.*

These insects form the Third Order. The wing-cases are coriaceous, with the extremity membraneous, folding the one over the other when at rest.

A large number of these feed on vegetable juices. The females are provided with an ovipositor, composed of three denticulated blade-like processes, which are lodged in a groove in the abdomen. With this instrument they pierce holes in vegetables, in which they deposit their eggs.

THE LANTERN FLY.†

Of all luminous insects, by far the most transcendent (if the accounts of writers are to be at all credited) are some of the *Hemipterous* order, and of the genus *Fulgora*. Of these the lantern fly of South America is said to be pre-eminent. This beautiful insect is, according to the measurement of one specimen, more than two inches and a half in length, with a hollow transparent projection of the head, seven lines in length (some individuals are larger in both respects), which is the organ whence has been said to issue the lamp-like flame. "Madame Merion," says Kirby, "informs us that the first discovery which she made of this property caused her no small alarm. The Indians had brought her several of these insects, which by day-light exhibited no extraordinary appearance, and she inclosed them in a box until she should have an opportunity of drawing them, placing it upon a table in her lodging-room. In the middle of the night the confined insects made such a noise as to awake her, and she opened the box, the inside of which, to her great astonishment, appeared all in a blaze; and, in her fright, letting it fall, she was not less surprised to see each of the insects apparently on fire. She soon, however, divined the cause of this unexpected phenomenon, and re-inclosed her brilliant guests in their place of confinement. She adds that the light of one of these *Fulgoræ* is sufficiently bright to read a newspaper by; and though the tale of her drawing one of these insects by its own light is without foundation, she doubtless might have done so had she chosen."

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* Hemiptera.

† Fulgora laternaria.

THE LANTERN FLY (*Fulgora laternaria*).

The *Fulgora laternaria* is said to be not the only blazing lamp of the genus; China produces one, little its inferior, the *F. candelaria*, provided with a slender recurved hollow projection from the head, in which resides the luminous matter; and India (see Donovan's "Insects of India") produces another, the *F. pyrrhorhynchus*, having a smaller snout than *F. laternaria*, of a deep purple hue, with a transparent tip of intense scarlet; and as these tints will be imparted to the transmitted light, the effect produced must, of course, be most splendid and striking.

LANTERN FLIES (*Fulgora candelaria*).

It must, however, be confessed, notwithstanding Madame Merion's tale, which savours no little of the romantic, that the luminous power of the *Fulgoræ* is very hypothetical. In shrillness of voice, and in many of their habits, they resemble the tree crickets; but late observers, who have closely investigated the natural history of these insects, and of the lantern fly of South America, in particular, deny that any luminous property is situated either in the hollow lantern of the head, or in any other part of the body: and affirm that the received account is altogether fabulous. Sieber, a practised entomologist, who took numbers of *Fulgoræ* during his stay in the Brazils (where he continued for several years), treats the whole as a ridiculous fable; in which statement he is borne out by observers, whose testimony we have personally heard, and who assert that the Indians regard the tale as originating in the mistake of the white men, who, seeing the fire-fly glancing about like a meteor, have in some unaccountable manner atttributed its luminosity to the *Fulgora*, perhaps because they could conceive no other use for the hollow projection from its head than that of a lantern. The true nature of the luminous property of insects is not yet fully understood; neither is the use of this singular provision very satisfactorily made out. In the glow-worm it has been conjectured to be a beacon-light to its mate, but this is not a sufficient explanation as it respects other luminous insects, where both sexes are alike lamp-lit. How great a part of our Creator's ways in Nature are past finding out!

A family of Hemipterous insects * may be distinguished, as to the species, by their having the rostrum short, and consisting of two or three joints only; the labrum also short, and without striæ; the eyes are moderate; and the body is generally very much depressed. Of these we give two examples, *Cimex lineatus* and *Cimex baccharum*. The most common species is the *Cimex lectularius*, the bed-bug.

The Aphis, or Plant-Louse, forms an extensive genus of insects.† They are interesting to naturalists because of their peculiar economy, and no less so to gardeners and farmers, on whose crops many species commit the most destructive depredations. The number of species is very large. More than three hundred have been actually described.

The sucker of the brown aphis of the oak is much larger than the body, and, when unemployed, is carried between the legs close to the belly, extending behind the insect, like a tail, slightly curved upward. The instrument consists of a transparent tube, terminating in a hole so minute, that Reaumur could not discover it with his most powerful microscopes, but he proved its existence, by pressing out from it a drop of fluid. By means of pressure, also, he could render more obvious two instruments of a brownish colour contained in the sucker, and which he conjectured to act like the piston of a pump; though, from their minuteness, this could not be fully established.

CIMEX LINEATUS.

CIMEX BACCHARUM.

No wonder that, with such an instrument, the aphides make great ravages in the vegetable world. Latterly, another of these pests ‡ has been very destructive to our apple-trees. It is thus described by Mr. Knapp :—"In the spring of the year," says he, "a slight hoariness is observed upon the branches of certain species of our orchard fruit. As the season advances, this hoariness increases; it becomes cottony, and toward the middle or end of summer, the under-sides of some of the branches are invested with a thick downy substance, so long as at times to be sensibly agitated by the air. Upon examining this substance, we find that it contains a multitude of small wingless creatures, which are busily employed in preying upon the limb of the tree beneath. This they are well enabled to do, by means of a beak terminating in a fine bristle, which, being insinuated through the bark and the sappy part of the wood, enables the creature to extract, as with a syringe, the sweet vital liquor that circulates in the plant. The sap-wort (*alburnum*) being thus wounded, rises up in excrescences and nodes all over the branch, and deforms it; the limb, deprived of its nutriment, grows sickly; the leaves turn yellow, and the part perishes. Branch after branch is thus assailed, until they all become leafless, and the tree dies.

"Aphides attack the young and softer parts of plants; but this insect seems easily to wound the harder bark of the apple, and by no means makes choice of the most tender parts of the branch. They give a preference to certain sorts, but not always the most rich fruits; as cider-apples and wildings are greatly infested by them, and, from some unknown cause, other varieties seem to be exempted from their depredations. The Wheeler's-russet and Crofton-pippin I have never observed injured by them. This insect is viviparous, or produces its young alive, forming a cradle for them, by discharging from the extremities of its body a quantity of long cottony matter, which becoming interwoven and entangled, prevents the young from falling to the earth, and completely envelopes the parent and the offspring. In this cottony substance we observe, as soon as the creature becomes animated in spring, and as long as it remains in vigour, many round pellucid bodies, which, at first sight, look like eggs, only that they are larger than we might suppose to be ejected by the animal. They consist of a sweet glutinous fluid, and are probably the discharges of the aphis, and the first food of its young. That it is thus consumed I conjecture from its diminution, and its by no means increasing so fast as fæcal matter would do, from such perpetually feeding creatures. I have not, in any instance, observed the young to proceed from these globular bodies, though they are found of various ages, at all times during the season. This lanigerous vestiture seems to serve likewise as a vehicle for dispersing the animal; for though most of our species of aphides are furnished with wings, I have never seen any individual of this American blight so provided; but the winds, wafting about the small tufts of this downy matter, convey the creature with it, from tree to tree, throughout the whole orchard. In the autumn, when this substance is generally long, the winds and rains of the season effectually disperse these insects, and we observe them endeavouring to secrete themselves in the crannies of any neighbouring substance. Should the savoy cabbage be near the trees whence they have been dislodged, the cavities of the under-sides of its leaves are commonly favourite asylums for them. Multitudes perish by these rough removals, but numbers yet remain, and we may find them in the nodes and crevices, on the other sides of the branches, at any period of the year, the long cottony vesture being removed; but still they are enveloped in a fine, short, downy clothing, to be seen by a magnifier, proceeding, apparently, from every suture, or pore, of their bodies, and protecting them, in their domestic state, from the moisture and frosts of our climate. This aphis, in a natural state, usually awakens and commences its labours very early in the month of March; and the hoariness on its body may be observed increasing daily; but if an infected branch be cut in winter, and kept in a warm room, these aphides will awaken speedily, spin their cottony nests, and feed as they are accustomed to do in the genial season."

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* Cimicidæ. † Aphides. ‡ Aphis lanigera.

Reaumur has proved that, in five generations, one aphis (plant-louse) may be the progenitor of five billions, nine hundred and four millions, nine hundred thousand descendants; and it is supposed that in one year there may be twenty generations; and, what is most remarkable and without parallel, the sexual intercourse of one original pair serves for all the generations which proceed from the female for a whole succeeding year.

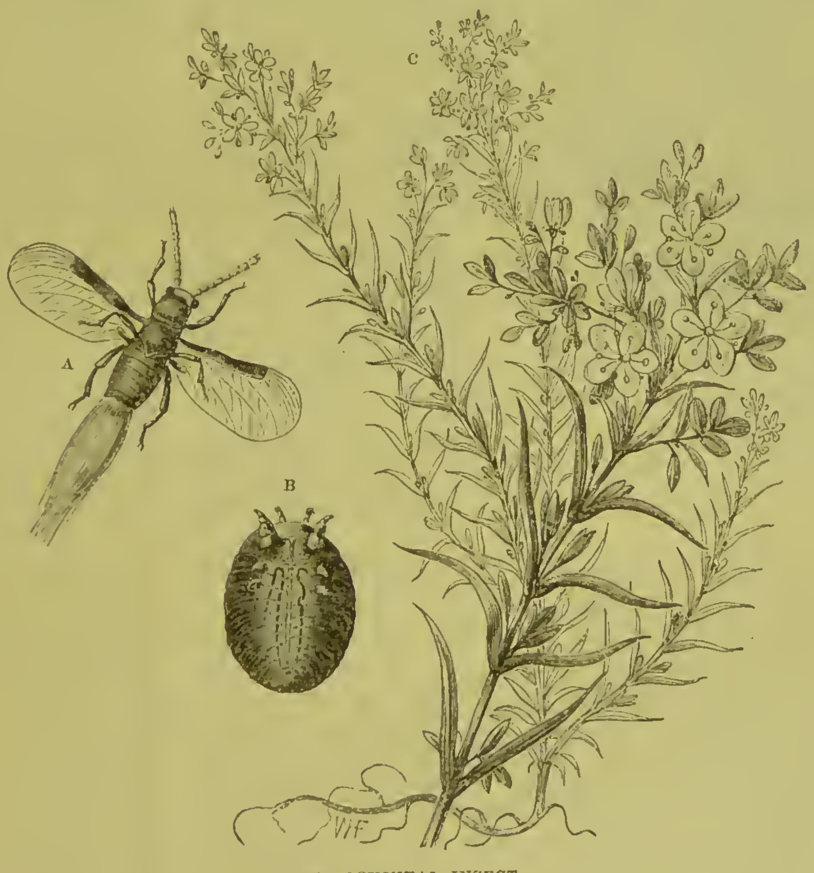
Much has been said of the damage done to the wheat by the orange-coloured fly, yet it is a fact that it is given in charge to three little parasites to keep it within due limits; and it was long the opinion of unscientific men that these destroyers of our enemy were really its parents, and the original source of all the mischief. Middleton, in his "Agriculture of Middlesex," speaking of the plant-louse, that is so injurious to the bean, tells us that the ladybirds are supposed either to generate or feed upon them, when, had he known the true character of these little insects, he would have recommended that they should be encouraged as friends to man, since they are surpassed by none as devourers of the aphides.

"The confounding of the apple aphis, or American blight," says Kirby, "that has done such extensive injury to our orchards, with others, has led to proceedings still more injurious. This is one of those species from the skin of which transpires a white, cottony secretion. Some of the proprietors of orchards about Evesham, observing an insect which secreted a similar substance on the poplar, imagined that from this tree the creature which they had found so noxious was generated; and, in consequence of this mistaken notion, cut down all their poplars. The same indistinct ideas might have induced them to fell all their larches and beeches, since they also are infested with aphides which transpire a similar substance. Had these persons possessed any entomological knowledge, they would have examined and compared the insects before they had formed their opinions, and being convinced that the poplar and apple aphis are distinct species, would have saved their trees."

THE COCHINEAL INSECT.*

Cochineal is used as a dye, producing the most beautiful scarlet; and it is also employed for various purposes where its colouring matter is required. It is a most important article of commerce, and long before its introduction by way of traffic into Europe, had been employed by the natives of Mexico, the country where it is alone cultivated. The appearance of cochineal is that of a shrivelled grain, of a dark purplish hue, and covered with a white bloom: hence, for two centuries after it became known, about the year 1518, its true nature was not ascertained. It was generally supposed to be the seed of some plant, till microscopic observations and direct information combined to dispel the mystery.

Cochineal is an insect closely allied to the *Aphides*, which we see so abundant on rose-trees, or geraniums, feeding in the same manner on the succulent shoots of a peculiar kind of fig, called in Mexico *nopal*. Hence plantations of this fig are kept up for the sake of the insect produce, and, from the name of the figs, are usually called *nopaleries*. Kirby says that cochineal, *coccus cacti*, is "chiefly cultivated in the Intendency of Oaxaca; and some plantations contain fifty or sixty thousand nopals in lines, each being kept about four feet high, for more easy access in collecting the dye. The cultivators prefer the most prickly varieties of the plant, as affording protection to the cochineal from insects, to prevent which from depositing their eggs in the flower or fruit, both are carefully cut off. The greatest quantity, however, of cochineal employed in commerce is produced in small nopaleries, belonging to Indians of extreme poverty, called *nopaleros*. They plant their nopaleries in cleared ground, on the slopes of mountains or ravines, two or three leagues distant from their abodes, and when properly cleaned, the insects are in a condition to maintain the cochineal in the third year."



THE COCHINEAL INSECT.
Coccus Cacti: A, male; B, female; C, plant cultivated for the purpose of rearing this species.

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* Coccus cacti.

The mode of procuring a stock is by purchasing in the market of Oaxaca twigs laden with young cochineal insects, which, after a careful nursing of several months, till about to reproduce themselves, are then distributed among the nopals. The first gathering takes place in about four months from this period, which is in August or September. Two more gatherings, usually the most productive, succeed during the ensuing course of the year. The gathering is performed by the Indian women, and requires great care and patience. It is done by means of squirrels' or stags' tails, with which the insects are brushed off the twigs and stems. After being thus collected they are killed, either by exposing them to the heat of the sun, or by immersion in boiling water, or by placing them in ovens. Humboldt informs us that the quantity annually exported from South America amounts to 32,000 arrobas, their worth £500,040 sterling. Dr. Bancroft estimated the annual consumption of cochineal in Great Britain at about 750 bags, or 150,000 lbs., worth, at the present price, £375,000. Although the East India Company offered a reward of £6,000 to any one who should introduce it into India, no success has yet attended any effort, an uncultivated and very inferior kind from Brazil being the only sort hitherto procured. Such is the importance, then, of this little insect, whence, as Kirby says, we may learn "the absurdity of despising any animals on account of their minuteness, remembering that they, as well as the hugest elephant, are the work of His hands in whose eyes there is neither great nor small, and whose power is alike displayed in every part of the domain of Nature."

Lac is a resinous substance, largely imported from India, where it is found in great abundance, adhering to various trees; it is the secretion of an insect allied to the cochineal, and known in science under the name of *coccus lacea*.

Lac is variously and extensively employed in the arts and manufactures. In India it is mixed with sand to form grindstones. Dissolved in water, and mixed with ivory-black, it forms a good and durable ink; it also enters into the manufacture of beads, and other female ornaments.

In this country lac is much used in the composition of varnishes, japanning, sealing-wax, &c.: it is known as stick-lac, when unseparated from the twigs to which it adheres; as seed-lac, when separated, pounded, and the colouring matter extracted by water; shell-lac, when strained, and allowed to harden in the form of thin flakes, or laminæ. Besides the use of lac in the composition of varnishes, &c., its colouring matter, under the name of lac-lake, and a still superior preparation, called lac-dye, is employed as a substitute for cochineal, in dyeing scarlet. Kirby observes "that the East India Company are said to have saved in a few months £14,000 in the purchase of scarlet cloths dyed with this colour and cochineal conjointly, and without any inferiority in the colour obtained."

The insect *coccus lacea*, which produces an article thus important in a commercial point of view, is found in almost incredible abundance on various trees, the juices of which constitute their food: of these two species of fig, the *ficus religiosa* and *ficus indica* seem the chief. "When the females," says Kirby, "have fixed themselves to a part of the branch of the trees on which they feed, a pellucid and glutinous substance begins to exude from the margins of the body, and in the end covers the whole insect with a cell of this substance, which, when hardened by exposure to the air, becomes lac. So numerous are these insects, and so closely crowded together, that they often entirely cover a branch; and the groups take different shapes, as square, hexagon, &c., according to the space left round the insect which first began to form its cell. Under these cells the females deposit their eggs, which, after a certain period, are hatched, and the young ones eat their way out. Though indisputably an animal secretion, many of the properties of lac are not very different from those of the juices of the trees on which the animal feeds, and which, therefore, would seem to undergo but little alteration." How minute, how feeble are the agents by which man is benefited! On looking at them we should be ready to say, Of what use are these in creation? Yet arts, manufactures, and commerce are dependent upon them; and though it may enforce upon us a lesson of humility, still we need not be surprised, since we ought to remember that, by the permission of God, agents as feeble as these have desolated kingdoms. Why then should they not, by his appointment also, be constituted so as to confer on mankind services connected with his social interests and the general good!

NERVE-WINGED INSECTS.*

The insects composing this Order may be distinguished by the following characters: wings four in number, membranous, generally naked, and more or less transparent, but sometimes hairy; the mouth is usually fitted for mastication, or furnished with mandibles or maxillæ; the larvæ are provided with six legs, and are active; their metamorphosis is variable, but is usually semi-complete. The character which gave rise to the name—the minute reticulation of the nervures of the wing—will also, in most instances, serve to distinguish the insects of this order from others.

THE DRAGON FLIES.†

These insects have the four wings of equal length; the tarsi three jointed; the antennæ very small, and resembling minute bristles; the eyes extremely large; the legs are rather small; and the abdomen is elongated, sometimes cylindrical, sometimes depressed, and terminated by membraneous appendages.

In the Makololo territories, Dr. Livingstone met with numbers of dragon-fly-looking insects, the larvæ of which prey upon ants. These they capture in a peculiar manner. The larva in question is about an inch and a quarter long, as thick as a crow-quill, and covered with black hair. It puts its head into a little hole in the ground, and quivers its tail rapidly. The ants come near to examine the novel object, and, as they advance somewhat too closely, urged on by curiosity, are suddenly seized by the forceps or graspers, with which the vibratory tail is furnished. As the head of this larva is buried beneath the ground, it becomes a question as to the sense by which the tail is so accurately guided to the object. On first seeing this larva, Dr. Livingstone imagined that the forceps were on its head; but when the whole body was exposed to view, their real position was at once apparent.

DRAGON FLIES.

CADDIS WORMS AND FLIES.‡

The insects belonging to this section are well known to anglers by the name of Caddis Flies, and in the larva state they are called Caddis Worms, or Cadew Worms.

Placing yourself by the side of a clear and shallow piece of water, you cannot fail to observe at the bottom little oblong, moving masses, resembling pieces of straw, wood, or even stone—the residences of a species of caterpillar. Very various is the structure of these dwellings. Some caterpillars select four or five pieces of the leaves of grass, which they glue together into a shapely polygonal case; others employ portions of the stems of rushes placed side by side, so as to form an elegant, fluted cylinder; some arrange round them pieces of leaves, like a spirally-rolled riband; other species construct houses which may be called alive, forming them of the shells of various aquatic snails of different kinds and sizes, even while inhabited, all of which are immovably fixed to it, and dragged along at pleasure. However various may be the form of the case externally, within it is usually cylindrical, and lined with silk. But, watch as you may, of the inmate of any one you will see nothing except the head and six legs, by means of which it moves itself in the water, and drags after it the case in which the rest of the body is inclosed, and into which, on any alarm, it instinctively retires.

In the basin of the Allier, in Central France, the lower strata consist of a calcareous sandstone, with bouldered pebbles and primitive fragments imbedded in it, and containing so much bitumen that the rays of the sun cause it to exude. There are also many beds of white, marly limestone, consisting of an amazing aggregate of the dwellings of these very caterpillars. These are quitted when the insect's metamorphosis is completed; and on the banks of rivers, or marshes, frequented by them, you may find groups of such empty cases, arranged much in the same manner as those we are now considering appear to have been when the calcareous matter incrusted them. Some are immediately surrounded and cemented together by the stalactitic substance—others by innumerable multitudes of casts of minute shells, arranged with some symmetry round each tube, and pressing closely on one another. More than a hundred of these shells may be counted on each tube, and ten or twelve tubes are constantly packed together within the space of a cubic inch. If, then, we consider that repeated strata, averaging five or six feet in thickness, and almost entirely composed of these tubes, appear once to have extended over the whole plain of the Limagne, occupying a surface of many hundred square miles, we shall arrive at an imperfect idea of the countless myriads of minute beings belonging to a single species of insect, which have lived and died in turn within the bosom of this once extensive lake.

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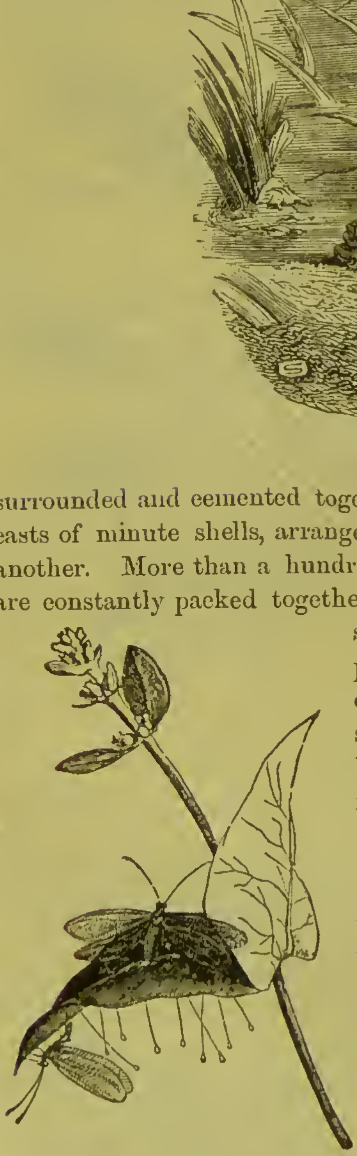
* Neuroptera. † Libellulidæ. ‡ Phrygania.

CADDIS WORMS AND FLIES.



HEMEROBIUS PERLA.

HEMEROBIUS PERLA.

As a specimen of another genus,* we give a specimen, *Hemerobius perla*, a well-known British species, of a pale yellow green, with delicately transparent and lustrous wings, and brilliant golden eyes. Its flight is feeble. The female lays her eggs on leaves. They are oval and whitish, and secured by a long hair-like stalk, or pedicle.

THE ANT-LION.†

The Ant-Lion, in its perfect stage of existence, is a four-winged insect, resembling the dragon-fly, both in appearance and general habits, preying in like manner on other insects, being one of the falcons of its race. It is not, however, to the perfect insect that we are now about to direct the attention of our readers, but to the larva, or insect in its imperfect stage of being, before it has undergone its final metamorphosis.

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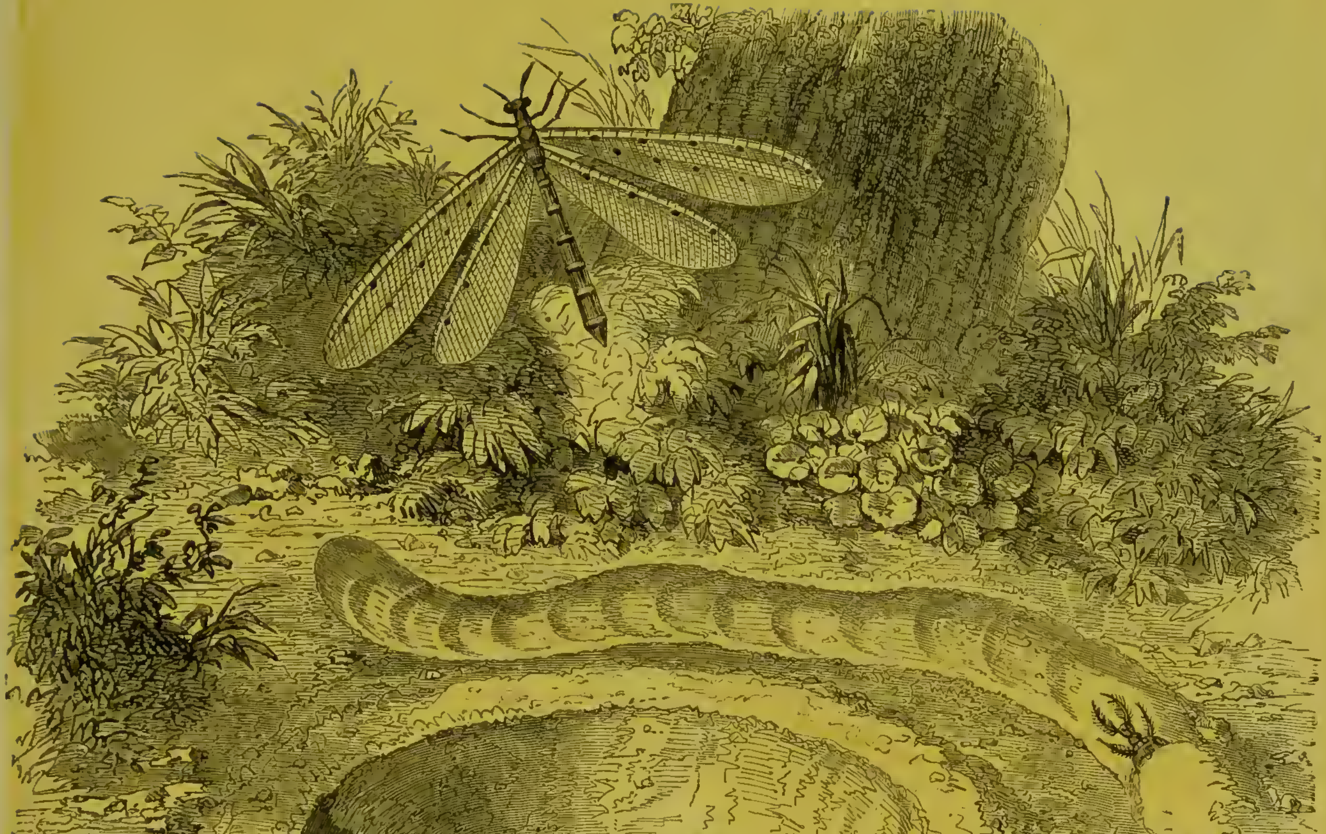
* Hemerobius.

† Myrmeleon ormicaleo.



THE ANT LION AND ITS PIT.

The habits and instincts of the larva of the ant-lion are so remarkable, that were they not attested by the most scientific entomologists, we should almost hesitate to give credit to the account. Without wings, on which to cleave the air, and not only slow in its motions on the ground, but capable only of walking backwards, yet, at the same time, endowed with the ferocious appetite of a tiger, which propels it to a life of rapine, how, it may be asked, can it ever seize its prey? how can it exercise its carnivorous instinct, thus ill adapted as a hunter for the chase? It effects, by the most astonishing artifice, what it could not do openly; it digs a pit-fall in which to take its victim, as the savage contrives to take the wild beast of the forest, the elephant or rhinoceros.

The ant-lion, in its larva state, feeds on the blood or juices of insects, but especially of ants, whence it derives its name; and, in order to their capture, it digs a conical pit in fine loose sand, concealing itself at the bottom, so as to be ready to seize, with its formidable jaws, the unfortunate captive, who, approaching the margin, is sure to slide down the sides of the pit, the sand giving way beneath its feet.

The curious process by which the ant-lion excavates its trap is thus described by Kirby:—"Its first concern is to find a soil of loose dry sand, in the neighbourhood of which, indeed, its provident mother has previously taken care to place it; and in a sheltered spot, near an old wall, or at the foot of a tree. This is necessary on two accounts: the prey most acceptable to it abounds there, and no other soil would suit for the convenience of its snare. Its next step is to trace in the sand a circle, which, like the furrow with which Romulus marked out the limits of his new city, is to determine the extent of its future abode. This being done, it proceeds to excavate the cavity by throwing out the sand in a mode not less singular than effective. Placing itself in the inside of the circle, which it has traced, it thrusts the hind part of its body under the sand, and, with one of its fore-legs, serving as a shovel, it charges its flat and square head with a load, which it immediately throws over the outside of the circle, with a jerk strong enough to carry it to the distance of several inches. This little manœuvre is executed with surprising promptness and address. A gardener does not operate so quickly or so well with his spade and his foot, as the ant-lion with its head and leg. Walking backwards, and constantly repeating the process, it soon arrives at the part of the circle from which it sets out. He then traces a new one, excavates another furrow, and, by a repetition of these operations, at length arrives at the centre of its cavity. One circumstance deserves remark, that it never loads its head with the sand lying on the outside of the circle, though it would be as easy to do this with the outward leg as to remove the sand within the circle by the inner leg. But it knows that the sand in the interior of the circle only is that to be excavated; and it therefore constantly uses the leg next the centre." In order, however, that one leg may not do all the work, and so become unduly fatigued, it uses each alternately, by tracing each furrow in an opposite direction, that is, by going from right to left one circle, and from left to right the next. Should it meet with small stones or pebbles in the progress of its labours, it jerks them, if not too large, over the margin of the pit; but, if it meet with one too heavy for this mode, it contrives to get it on its back, and, with painful labour, commences its backward ascent up the inclined and slippery embankment of the pit. Often does it fail, and often does it renew its labour, undaunted by disappointment, till at last its efforts are successful.

The pit, when completed, is about two inches deep, and three inches wide at the top, whence it gradually diminishes to the bottom, so as to form a conical hole in the sand. Here, then, in expectation of his prey, lurks the ant-lion at the bottom of his trap, carefully covered over with fine sand, so that no part, except the points of his expanded forceps, is visible. He has not long to wait, the ants are swarming around, and one of them presently makes its appearance at the margin of the pit, when, lo! the sand gives way, and down it slides into the jaws of the grim destroyer. Should it, however, be able to stop itself, as sometimes happens, before it reaches the bottom it endeavours to re-ascend, being fully aware of its danger, but in vain; the eyes of the treacherous foe are upon it, and rousing himself in a moment, he throws a shower of sand upon the struggling captive, which, overwhelming it at once, inevitably brings it within his reach. And now begins the feast; his jaws, which are formidable claw-like instruments, are also hollow, and "furnished with a lateral piston" for sucking up all the juices of the body; these he drives into the body of his prey, and gluts himself on the blood, leaving the carcase dry and shrivelled. This he afterwards jerks out of his den, and, covering himself as before, grimly waits for another victim. Thus for nearly two years does the ant-lion lead a life of artful rapine, feeding on such insects as chance brings within his grasp.

When the ant-lion is about to change into a pupa, it constructs a cocoon of sand, which it lines with a beautiful tapestry of silk, the whole being less than half an inch in diameter; the pupa itself, when rolled up, filling only a space of about half this size. When it has remained in the cocoon about three weeks, it breaks through the envelope, and emerges to the outside, the creature making use of its mandibles, or jaws, to gnaw the cocoon. Having arrived at the outside, it only requires to expand its wings and its body, to complete its transformation; but this process is very amazing; for though, on emerging, the creature is not more than half an inch in length, it almost instantaneously stretches out to an inch and a quarter; while its wings, which did not exceed the sixth of an inch, expand to nearly three inches.

MAY-FLIES.*

These insects, in their first and intermediate state, are aquatic: they either live in holes on the banks of rivers or brooks, below the water, so that it enters into their habitations, which they seldom quit; or they swim about and walk on the bed of the stream, or conceal themselves under stones, or on pieces of stick. Though their life, when they assume the perfect state, is usually extremely short, some being disclosed after sun-set, laying their eggs and dying before sun-rise, and many not living more than three hours, yet in their preparatory state their existence is much longer; in some one, in others two, in others even three years.

MAY-FLIES.

The different species assume the imago, or reach the perfect state, at different times of the year; but the same species appear regularly at nearly the same period annually, and, for a certain number of days, fill the air in the neighbourhood of the rivers, emerging also from the waters at a certain hour of the day. Swammerdam observed some which began to fly about at six o'clock in the evening, or about two hours before sun-set; but the great body of those noticed by Reaumur did not appear till after that time; so that the season of different harvests is not better known to the farmer than the time in which the ephemeræ of a particular river are to emerge is to the fisherman. Yet a greater degree of heat or cold, the rise or fall of the water, and other circumstances we are not aware of, may accelerate or retard their appearance. Between the 10th and 15th of August is the time when those of the Seine and Marne, which Reaumur described, are expected by the fishermen, who call them manna: and when their season is come, they say, "The manna began to appear," "The manna fell abundantly, such a night;" alluding either to the astonishing quantity of food which the ephemeræ afford the fish, or to the large quantity of fish which they take.

Reaumur first observed these insects in the year 1738, when they did not begin to show themselves in numbers till the 18th of August. On the 19th, having received notice from his fishermen that the flies had appeared, he got into his boat about three hours before sunset, and detached from the banks of the river several masses of earth filled with pupæ, which he put into a large tub full of water. This tub, after staying in the water till about eight o'clock, without seeing any remarkable number of flies, and being threatened with a storm, he caused to be landed, and placed in his garden, at the foot of which ran the Marne. Before the people had landed it, an astonishing flight of ephemeræ took place from it. Every piece of earth that was above the surface of the water was covered by them, some beginning to quit their slough, others prepared to fly, and others already on the wing; and, even when under the water, they were to be seen in a greater or less degree of forwardness. The storm coming on, he was obliged to quit the amusing scene; but when the rain ceased to fall, he returned to it. As soon as the cloth with which he had ordered the tub to be covered was removed, the number of flies appeared to be greatly augmented, and kept continually increasing; many flew away, but more were drowned. Those already transformed, and continually transforming, would have been sufficient of themselves to have made the tub seem full; but their number was soon very much enlarged by others attracted by the light. To prevent their being drowned, he caused the tub to be again covered with the cloth, and over it he held the light, which was soon concealed by a layer of these flies, that might have been taken by handfuls from the candlestick.

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* Ephemeræ.

But the scene round the tub was nothing to be compared with the wonderful spectacle exhibited on the banks of the river. The exclamations of his gardener drew the illustrious naturalist thither; and such a sight he had never witnessed, and could scarcely find words to describe. "The myriads of ephemeræ," says he, "which filled the air above the current of the river, and over the bank on which I stood, are neither to be expressed nor conceived. When the snow falls with the largest flakes, and with the least interval between them, the air is not so full of them as that which surrounded us was of ephemeræ. Scarcely had I remained in one place a few minutes, when the step on which I stood was quite concealed with a layer of them, from two to four inches in depth. Near the lowest step, a surface of water, of five or six feet dimensions every way, was entirely and thickly covered by them, and what the current carried off was continually replaced. Many times I was obliged to abandon my station, not being able to bear the shower of ephemeræ, which, falling with an obliquity less constant than that of an ordinary shower, struck continually, and in a manner extremely uncomfortable; every part of my face, eyes, mouth, and nostrils were filled with them."

Before ten o'clock this interesting spectacle had vanished. It was renewed for some nights afterwards, but the flies were never in such prodigious numbers. The fishermen allow only three successive days for the great fall of the manna; but a few flies appear both before and after, their number increasing in one case, in the other diminishing. Whatever be the temperature of the atmosphere, whether it be cold or hot, these flies invariably appear at the same hour in the evening, that is, between a quarter and half-past eight; towards nine they begin to fill the air; in the following half-hour they are in the greatest numbers, and at ten there are scarcely any to be seen: so that, in less than two hours, this infinite host of flies emerge from their parent stream, fill the air, perform their appointed work, and vanish. A very large proportion of them falls into the river, when the fish have their grand festival, and the fishermen a good harvest.

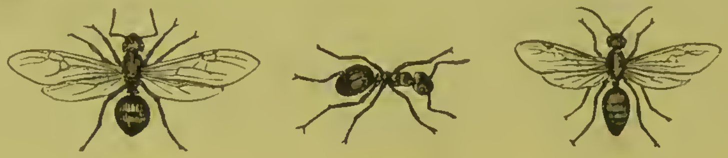
Some species of the ephemeræ are distinguished by another peculiarity, unparalleled, as far as is known, in the rest of the insect world. After being released from the puparium, and making use of their expanded wings for flight, often to a considerable distance, they have yet to undergo another change. They fix themselves by their claws, in a vertical position, on some object, and withdraw every part of the body, even the legs and wings, from a thin pellicle, which has inclosed them, as a glove does the fingers. It is easy to conceive how the body, and even legs, can be withdrawn from their cases; but it is not so easy to imagine how the wings, which seem as thin, as much expanded, and as rigid as those of a fly, can admit of having any sheath stripped from them; much less how they can be withdrawn, as they are, through a small opening at the base of the sheath. The fact seems to be that, though the outer covering is rigid, the wing inclosed in it, notwithstanding it is sometimes more than twenty-four hours before the change ensues, is kept moist and pliable. In proportion, therefore, as the insect disengages itself from the anterior part of the skin, the interior or real wings become contracted, by a number of plaits, into a form nearly cylindrical, which readily admits of their being pulled through the opening lately mentioned; and as soon as the insect is released from its envelope, the plaits unfold, and the wing returns to its proper shape and dimensions.

MEMBRANE-WINGED INSECTS.[*]

The comparatively simple neuration of the wings will serve to distinguish insects of the next Order, *Hymenoptera*, from those of the last Order, *Neuroptera*, where the wing is divided by minute nervures into an infinite number of little cells, resembling net-work; whereas, in the species of the present order, the basal portion of the wings is furnished with longitudinal nervures only, and the apical portion is divided into comparatively few cells.

THE ANT.

This well-known genus[†] of insects has attracted attention from the earliest ages. Ants are of three classes—males, females, and labourers or workers, so called from their doing all that is necessary for the welfare of the community to which they belong. These latter have no wings; and they have to bear severe toil in traversing the ground, and in climbing up the steep paths that may lie in their way, while their companions fly freely in the air. The males and females have simple and compound eyes; the labourers are often without the simple eyes.


Female. Neuter. Male.

WOOD ANTS.

Ants swarm, but not like bees. Their infant colonies appear to consist of very small parties, all perhaps the offspring of a common parent. The greater part of the females, prepared to deposit their eggs, and alighting in the neighbourhood of the nest, are seized by the labourers, who drag them thither, and keep them prisoners until they are laid. Each female, too, is attended by a retinue of these ants, who treat her with the greatest deference, and are anxious to anticipate her wants. At the end of a fortnight the caterpillar appears, in the form of a transparent grub, with a head and wings. The nurses feed it with a fluid they disgorge; and, as the caterpillars are very tender, these ants are constantly employed in conveying them to different parts of the nest, where the temperature is best suited to them.

Well might Clare say:—

"Thou little insect, infinitely small,
  What curious texture marks thy tiny frame!
How seeming large thy foresight, and withal,
  Thy labouring talents not unworthy fame,
To raise such monstrous hills along the plain,
  Larger than mountains when compar'd with thee:
To drag the crumb dropped by the village swain,
  Huge size to thine, is strange, indeed, to me.
But that great Instinct which foretells the cold,
  And bids to guard 'gainst Winter's wasteful power,
Endues this mite with cheerfulness to hold
  Its toiling labours through the sultry hour:
So that same soothing Power, in misery,
  Cheers the poor pilgrim to eternity!"

Only let an ant's nest be disturbed, and their vigilance will be seen. Much less occupied in providing for their own safety than for that of the caterpillars, all are in motion, and no danger can stop them in their labours. An observer cruelly cut an ant in two, but the poor creature did not relax; and with the half of the body which bore the head, it carried off ten caterpillars into the interior of the nest before it died.

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[*] Hymenoptera.

[†] Formica.

Other labours are worthy of notice. It is necessary that the caterpillars should be kept very clean, and so the ants constantly pass their tongues and jaws over their bodies, and thus render them perfectly white. After the grubs have reached their full growth, they surround themselves with a silken cocoon, and become pupæ, or chrysalises, which, food excepted, require as much attention as before. They are removed from the bottom of the nest to the surface every morning, and are taken back again every evening. Even the extraction of the ants from the cocoon is the business of the workers. They know that the perfect insect is ready to appear, but too weak to effect its escape; but how they know this we cannot tell. As soon, however, as the period has arrived, all are in a great bustle. Three or four mount on one cocoon, and begin to open it where the head lies, and apparently with great care. The first effort is by pulling off a few threads to thin that part; several small openings are then made, and very patiently they cut the threads one by one, until with the utmost gentleness an opening is formed, which allows the prisoner to escape.

Still the ant has a covering; but this the workers pull off, carefully relieving every member from its case, and when there are wings, nicely opening them. Even now their labours do not end. For several days they follow and watch the young insects everywhere, teaching them to thread the paths and windings of the common dwelling, nourishing them with the greatest care, and also performing the difficult task of stretching the wings of the males and females—which would otherwise remain folded up—and that so carefully, as not to injure these frail and delicate members. When, too, the latter take their flight, the workers accompany them to the summit of the highest herbs, showing still the tenderest solicitude, some even endeavouring to retain them, feeding them for the last time, caressing them, and when, at length, they rise into the air and disappear, seeming to linger over those whom they have watched so carefully, and will never see again. There is no parallel to this in the whole animal world.

What, it may be asked, becomes of the real parents? And, doubtless, it might be replied, they are properly employed, when it is so wisely ordered that their place should be fully supplied. The fact is, they are not wanting in affection, but when a colony is founded, they have enough to do to supply it with eggs for future females, males, and workers, which are said to be laid at three different seasons. Here is the proper duty of the mother, and it is faithfully done. Unlike creatures of a higher order, she betrays no trust. What is required of her at different periods is performed promptly and well. Occupied now in the manner just described, yet, when the nest was first formed, she did all that such a mother could do; and it was only when the workers became numerous enough to perform their proper tasks, and relieve her, that she left the young to their charge, and employed herself in increasing the colony.

One fact in proof of her affection ought not to be omitted. When a female first issues from the chrysalis, she is adorned with two pairs of wings, one pair being larger than her body. But prepared to lay eggs, she twists and contorts her wings, till they finally drop off, and gives herself wholly to the work committed to her.

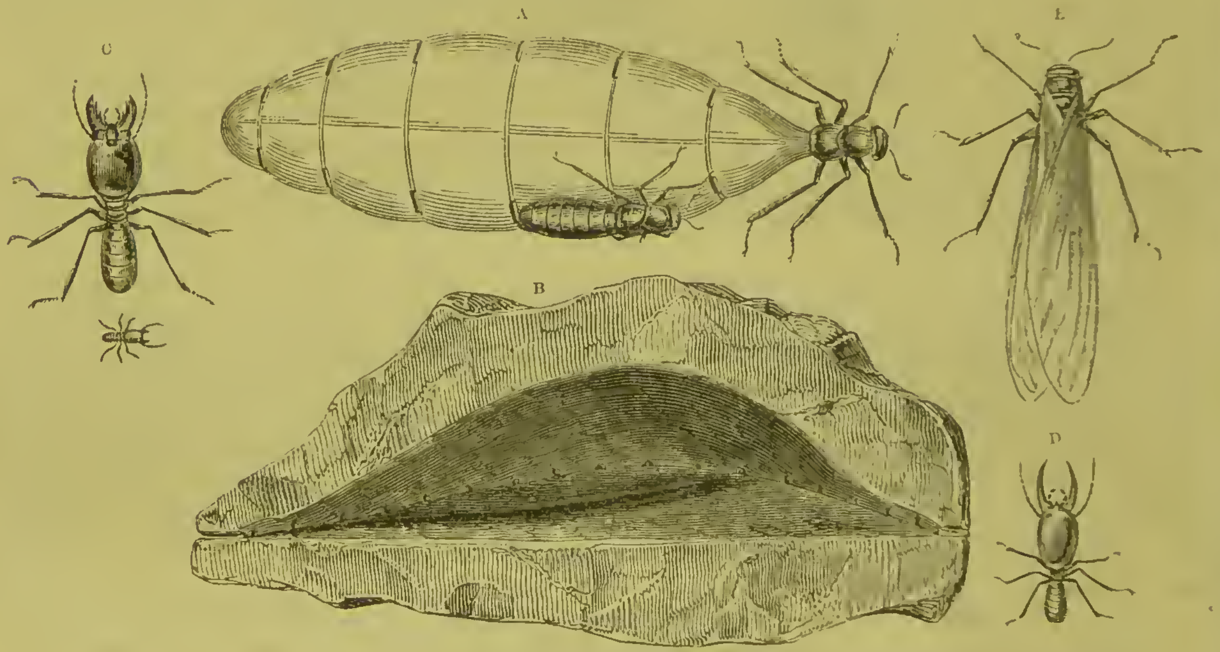
All the movements of ants are interesting from the time when they have simply a cavity in the earth, and commence the building of their little fabric, which daily increases in size. Here and there they leave cavities, where they intend to form the galleries which are to lead to the exterior, and during the day all the passages are kept open. The roof becomes convex, but not solid, for it is designed to include many apartments or stories.

Scooping out the under portion of their dwelling, they form what has been called their "halls," low and heavy in structure, yet adapted to receive, at certain hours of the day, the caterpillars and chrysalises. There is a free communication in these halls by means of galleries. Were the materials loose, they would soon be thrown into confusion, but the earth is tempered by the ants with rain-water, and hardened in the sun. The substances composing the ant-hill are thus so compactly bound together, that certain fragments may be moved without injury to the rest. A defence against the weather is also secured by the same means. "I never found," says Hüber, "even after long and violent rains, the interior of the nest wetted to more than a quarter of an inch from the surface, provided it had not been previously out of repair, or deserted by its inhabitants."

The largest chamber, placed nearly in the centre of the building, is much loftier than the rest, and traversed only by the beams that support the ceiling. In this spot all the galleries terminate. and this forms, for the most part, their usual residence. When the ant-hill is placed against a declivity, the whole interior may be seen by raising up the straw roof. The underground residence consists of a range of apartments excavated in the earth, taking a horizontal direction.

A friend of the writer's was some time ago walking in Stanstead Lane, Sydenham, when he observed a nest of the common yellow ant, built between the stems of way-side plants, and by their means partially suspended over a stream of running water—a striking instance of constructive ingenuity.

The wars of the fallow ants are very extraordinary. "I have witnessed," says Hüber, "the inhabitants of two large ant hills engaged in a spirited combat; two empires could not have brought into the field a more numerous or more determined body of combatants." Of the same species, and so much alike, yet it rarely happens that two of the same side attack each other; and when this takes place, those which err for a time caress their companions with their antennæ, and readily appease their anger. Not only are they said to march, countermarch, retreat, and take prisoners, but they alter their plans according to various circumstances.

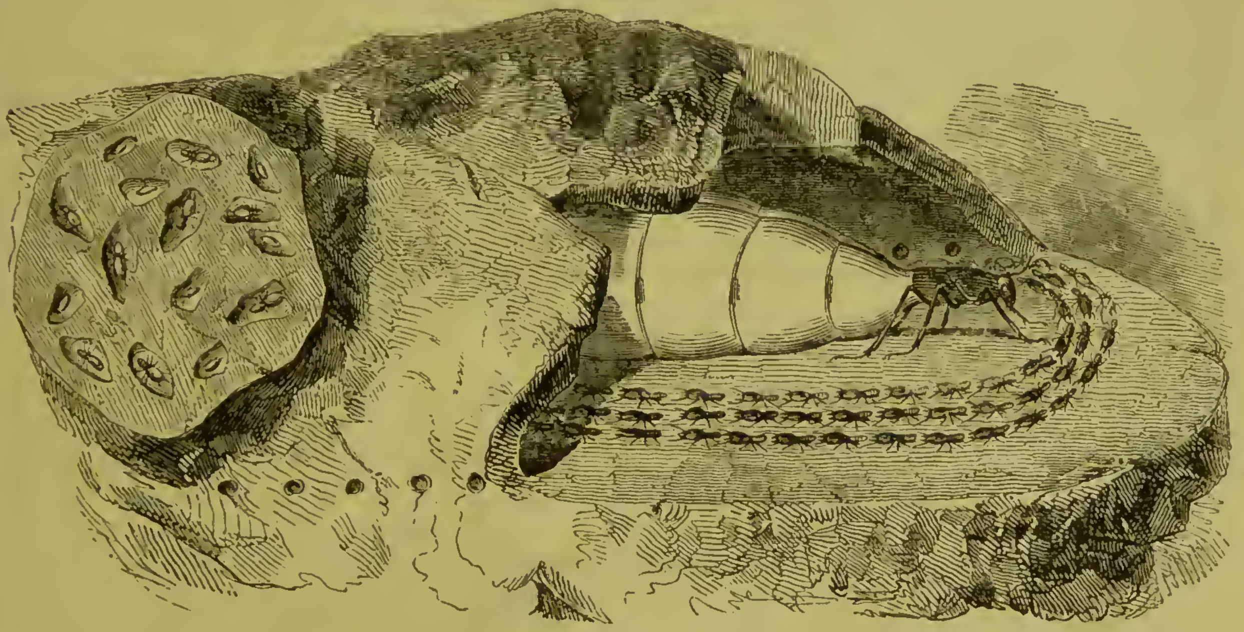


A. QUEEN ANT. B. ROYAL CELL. C. SOLDIER ANT. D. WORKER ANT. E. ANT PREPARING FOR FLIGHT.

The rufous ant, a courageous, armed, and lazy insect, obtains servants by singular means: it seizes the caterpillars and chrysalises of the colony it attacks, educates them for itself in its own nest, and when they are perfect, it employs them in its service. Many curious circumstances mark these expeditions. There is reason to think that these ants first send out spies, who describe the route to be taken. They push each other with the head or jaws, or play with the antennæ, perhaps to rouse to effort, or tell what is about to be done. About five o'clock, in a warm summer afternoon, they start, eight or ten ants being usually in advance; but no sooner do they pass beyond the nest, than they move back, wheel round in a semi-circle, and mix with the main body, while others succeed to their station. All in their turn pursue the same course; and after passing through the grass for about thirty feet, they disperse, and, like dogs on the scent, explore the ground with their antennæ. Soon they discover the colony of which they are in search, its sentinels dart upon the colonists with the utmost fury, crowds rush forth from their various avenues, but the besiegers compel them to retreat, and by breaching the walls or entering the gates, advance into the city. In a few minutes they appear again, each one carrying in its mouth a caterpillar or a chrysalis, and they return home the way they came.

Another fact, equally singular, is, that the ants keep and feed certain other insects, extracting from them a sweet and nutritious liquid, just as we obtain milk from cows. The milch cattle of the ants are the gall insects, and the aphides, or plant-lice. The latter insert their suckers into the bark of a tree, and thus absorb its sap, which becomes by digestion a fluid, scarcely inferior to honey in sweetness. When no ants are near to receive it, the aphides throw it to a distance by a jerking movement which they give their bodies. When ants are present, they watch this movement, and immediately suck down the fluid. They know, too, how to milk the aphides, patting the abdomen, first on one side, and then on the other, with their antennæ, and eagerly drinking the little drop which issues forth. An ant having exhausted the milk of one aphis, goes to others, and when satiated, returns to its dwelling.

Still more strange as it may seem, these milch cattle are not always considered the common property of a tribe of ants, but divided between two parties. The aphides on the branches of a tree or the stalks of a plant may be thus appropriated, and should intruders in any case appear, anger is manifest, and efforts are made to drive them away. It appears, moreover, that these milch cattle may be moved from place to place. Hüber observed some yellow ants, apparently very jealous of their stock, following them about, caressing them whenever they wished for the honeyed juice, which the aphides never refused, and removing them in their mouths to a place of safety on the slightest appearance of danger. Not less careful are they of these little creatures than the husbandman of his flocks and herds.



CELL OF A QUEEN OF THE TERMITES BELLICOSI, BROKEN OPEN IN FRONT; THE LABOURERS SURROUNDING HER, AND CARRYING OFF HER EGGS.

In reference to the words of Solomon, Dr. Johnson thus wrote :—

> “ Turn on the prudent ant thy heedless eyes,
> Observe her labours, sluggard, and be wise.
> No stern command, no monitory voice,
> Prescribes her duties, or directs her choice ;
> Yet timely provident she hastes away,
> To snatch the blessings of a plenteous day ;
> When fruitful Summer loads the teeming plain,
> She crops the harvest, and she stores the grain.
> How long shall sloth usurp the useless hours,
> Unnerve thy vigour, and enchain thy powers ?
> While artful shades thy downy couch inclose,
> And soft solicitation courts repose,

> Amidst the drowsy charms of dull delight,
> Year chases year with unremitted flight,
> Till want now following, fraudulent and slow,
> Shall spring to seize thee, like an ambush'd foe."

At Tala Muneongo (Angola) Dr. Livingstone met with a red carnivorous ant, which swarms in myriads, and is useful in devouring refuse animal matters which prove very annoying. When disturbed by design or accident, they at once attack the intruder, no matter whether on foot or on ox-back. Their bite is like "a spark of fire;" and when hundreds are engaged at once, "Ugh! they would make the most lethargic mortal look alive." They not only bite, but twist themselves about, so as to lacerate as much as possible, thereby adding to the severity of their poison. They know no fear, and attack the largest as well as the smallest animals, and devour the termites, or white ants, rats, mice, and even reptiles of large size. The great python, or boa, is not safe; for when this snake is torpid after a full meal, and takes his usual siesta, they cover him, and inflict their wounds until he expires, being overcome by the myriads to whom he furnishes a feast.

In the large flat beyond Lake Dilolo, flooded during a great portion of the year, there is a species of black ant, in great abundance, which during the dry season lives in chambers excavated in the earth; but before the rain sets in, as if foreseeing the inundation about to ensue, these ants ascend the tall stems of grass, above high-water mark, and there build little houses, of black, tenacious loam, some of which are about the size of a bean, and others considerably larger. In these uplifted habitations they dwell, descending when the plain becomes sufficiently dry for their labours on the earth. How strange is the overruling guidance of instinct! On the borders of the Kalahari Desert, near the waters of Mashüé, there is a large black ant, nearly an inch in length, termed "leshónya," which, when irritated, emits a strong, pungent, and very disagreeable odour. The scent is as volatile as ether, for, on disturbing the insect with a stick, the odour is instantly perceptible.

WHITE ANTS.*

Allusion has already been made to instances in which female insects are larger than males, but this is nothing compared with the prodigious difference between the sexes of *Termes fatale*, and other species of white ants, whose males are often many thousand times less than the females, when the latter are distended with eggs. When the business of oviposition commences, they take the eggs from the female, and place them in the nurseries prepared for their reception. Her abdomen now begins gradually to extend, till, in process of time, it is enlarged to one thousand five hundred or two thousand times the size of the rest of her body, and her bulk equal to that of twenty or thirty thousand workers. This part, often more than three inches in length, is now a vast mass of eggs, making long circumvolutions through numberless slender serpentine vessels; which, like the undulations of water, produce a perpetual rise and fall over the whole surface of the abdomen, and occasion a constant extrusion of the eggs.

The labourers of the white ants attend the queen while she is laying, and that with the utmost care; for, as she cannot then move about, they are under the necessity of carrying off the eggs, as they are laid, to the nurseries. The extraordinary labour which this requires in the community may be understood, when, according to Smeathman, she lays sixty eggs in a minute, which will amount to 86,400 in a day, and 31,536,000 in a year.

These insects have generally been called "ants," probably on account of the similarity of their manner of living, and their skilful and diligent labour; but they are by no means the same kind of insects. They certainly not only equal, but excel ants, bees, wasps, and beavers, in the art of building; and, if we take into account the comparative size of the architects, we find, on comparing the hillocks constructed by these insects with the most colossal works of man, that the result is calculated to awaken in us sentiments of humility. The great pyramid of Cheops, in its original state, before the base became covered by the accumulation of sand, was about four hundred and eighty feet in height. It was, therefore, about ninety-six times the height of a man, assuming the average stature of Africans to be five feet. The hillocks which the termites raise are about a thousand times higher than the insects which construct them; so that these edifices of the white ants are, relatively, many times higher than the loftiest of our monuments.

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* Termites.

These artificial mounds are surprisingly strong; they are but of small circumference, compared with their height, and, when finished, are pointed at the top, so that you might imagine, to look at them, they could be blown down by a violent wind; but, in reality, they are proof against most assaults. While they are still in the course of construction, and when their domes are accessible to the wild bulls, these animals may often be seen standing on their summits, as sentinels to the rest of the herd; and Mr. Smeathman assures us that he and his companions were in the habit of climbing up them, in order to survey the surrounding country. In some regions their magnitude, regularity, and numbers make them resemble an assemblage of negro huts. They rise from eight to ten feet high, with a smooth surface of rich clay, excessively hard, and well-built. Situated in the centre of the ground worked by each colony, these edifices may be said to constitute the capital of the community; and, like our own large cities, they have their public streets and squares, through which a numerous population is constantly passing to and fro; their magazines, always well filled with provisions; their nurseries, in which new generations are reared by the care of the community; and, lastly, the palace of their sovereigns, who are, in truth, the actual father and mother of their subjects.

This description applies to the nests of the *Termes bellicosus*, which is the largest of the species observed by Mr. Smeathman. It would appear, from the memoirs of various authors, that there exist at least twenty-four different species of these insects, nine of which belong to Africa, nine to America, two to Asia, and two to Europe. All the various species are miners, and most of them, moreover, are architects. Some among them build their nests on trees, around a large branch, which they carefully preserve, when it suits their purpose. These nests are often as large as a sugar-barrel; and, though exposed to the storms of the tropics, and composed entirely of small pieces of wood, glued together by means of the gums of the district, and the juices yielded by the workers themselves, they are never torn away.

The marching termites are no less curious than the warlike species. They seem to be much scarcer and larger than the other. Smeathman was fortunate enough to see one of their armies march by him. He says, "One day, on my return through the thick forest, suddenly I heard a loud hiss. This noise caused me to move a few paces from the path, where, to my great astonishment and pleasure, I saw an army of termites coming out of a hole in the ground, which could not be above four or five inches wide. They came out in vast numbers, and, seemingly, as fast as they could possibly march. In less than a yard from the place they divided into two columns, composed chiefly of the labourers, twelve or fifteen abreast, and crowded as closely as sheep in a drove, going straight forward, and among them, here and there, a soldier was to be seen. While these were hastening along, a great many soldiers appeared, spread about on both sides of the two lines of march, some a foot or two distant, standing still or sauntering about, as if on the look-out for any enemies who might assail the labourers. But the most extraordinary part of the march was the conduct of some of the soldiers, who, having mounted the plants which grew here and there, had placed themselves on the points of the leaves, which were raised ten or fifteen feet from the ground, and overlooked the army marching below. Every now and then one or other of these would beat with his forceps upon the leaf, making a noise similar to that made among the warrior species. This signal produced the same effect upon the marching white ants; for instantly the whole army returned the noise, and obeyed by increasing their pace with the utmost haste. At length the two columns united into one, and then descended into the earth by two or three holes. They continued marching by me for above an hour, as I stood admiring them, without any diminution of their numbers."

Towards the beginning of the rainy reason, these insects attain their perfect state. Their form and size are then much altered, and they are furnished with four large, transparent wings, with which to wing their way in search of a new settlement.

Like the majority of insects, the termites proceed from an egg, and pass through various stages before attaining perfection. In every nest there are found larvæ, nymphs, and perfect insects, accompanied by an immense number of neuters. The latter fulfil the functions of soldiers, and are exclusively occupied in watching over the common safety, as well as in maintaining good order. The larvæ and nymphs are by no means idle during their transition states, but perform all the labours required in the community. In fact, they build the dwellings, dig the excavations, amass the provisions, and attend upon the common mother, whose eggs they receive and take care of. Though so much work devolves upon them, they are of very small size. The workers of the *Termes bellicosus* are not larger than our common ants, which they so much resemble that the Creoles and most travellers still call them by that name. Their whole body is of such extreme delicacy that the slightest touch crushes them; but their head is provided with sawlike mandibles, of so strong and horny a substance as to enable them to attack the hardest bodies, excepting only stones and metals.

The soldiers are about twice their length, and weigh as much as fifteen of the workers. This weight is owing to their enormous horny heads, which are much larger than their bodies, and armed with sharp pincers, true weapons of offence, quite unfitted for the purposes of ordinary labour. These preserve, through the whole of their lives, the characters and attributes which have obtained for them the name of soldiers. Although they hardly number one hundredth part of the whole insect population, they constitute a distinct class, which may be compared to the nobility of a monarchy, while the larvæ may be looked upon as the plebeians of the community. At ordinary times they live in idleness, merely keeping guard, or watching the labours of the workers, over whom they evidently exercise authority. In times of war they show the utmost valour, attacking the enemy, and ready to sacrifice themselves if needful, for the common safety. No sooner is the first blow struck against one of their edifices, than the nearest sentinel is seen to hurry forward. The alarm is given, and in an instant a crowd of combatants hasten to the point of attack, moving their heads in all directions, and opening and shutting their forceps with a loud noise. When once they have fixed these formidable weapons into any substance, nothing can make them loose their hold. They will be torn piecemeal without unlocking their jaws; and woe betide the unfortunate hands and legs which are unprotected from their gripe! They at once draw blood; so that the negroes, who are without shoes and only half-clothed, are soon put to flight; and even Europeans who venture to assail their strongholds do not come off without formidable wounds.

"I was one day," says the Rev. J. Statham, "induced to go out upon the top of a verandah at Gusserah, and no sooner had I put my foot on the floor than the beam gave way, crumbling to atoms, and letting me down, with bricks, mortar, &c., a distance of ten feet; fortunately, I caught hold of another beam, and broke my fall, or the consequence might have been fatal. On examination, nearly all the rafters were found to be completely hollow, the white ants having eaten their way through the whole of them. So destructive are these little depredators, that nothing is safe unless placed on small stone vessels surrounded by a trench of water, and even then care must be taken that the water is replenished before completely evaporated, or the van of the besieging army will storm the trenches, and riot on the spoils of the drawers, trunks, almirahs, or boxes, as the case may be. A young gentleman having arrived at my house late one evening, the servants who brought in his trunks left the one containing his shirts, white jackets, and trousers, standing on the floor of the ghusselkhannah all night. The next day, when opened, the most wonderful metamorphosis had been effected upon the contents; every article of clothing presenting, when held up, the appearance of old-fashioned blond lace, being pierced with thousands of holes. Each insect working upwards had wrought out for himself (carefully avoiding breaking into his neighbour's path) a covered way to the top, so that though the garments maintained their original shape, yet there could not be found any one piece of cloth as large as a sixpence in the whole of the contents. The order in which these minute sappers and miners move is remarkable; indeed, their instinct at times almost leads one to suppose they are gifted with reason.

"The smaller species, or red ants, are constant depredators on the articles of the godown and bottle khannah, devouring sugar, butter, bread, cheese, and pastry, with unsparing voracity. The earth literally teems with them, and the utmost caution and pains are necessary to preserve viands from their destructive jaws. I have often watched their motions with surprise. Sometimes I have laid a piece of sweetmeat on a table, and have picked up an ant, and placed it upon the table also: after reconnoitring the place, he has descended by one of the legs, and rapidly seeking his fellows, they have appeared to understand his communication, and have hastily turned back, and meeting others, they also have spread the news, till at length the announcer of the tidings has returned to the table followed by a long train of his fellow-citizens, who greedily seizing as much as each could conveniently travel with, have, in a continuous line about four abreast, descended by another leg of the table, so as not to interrupt the approach of the column advancing to the prey. In this manner the whole has been carried off, and when no more remained, the tidings have spread back to the advancing column, who, immediately retracing their steps, have sought other sources of supply. Often have I been astonished at the immense loads they will carry to their stores. I have sometimes seen a large cockroach steadily advancing perpendicularly up the wall, and upon inspection have discovered hundreds of these little provident insects all busily employed beneath the body, every leg being firmly griped by as many as could possibly lay hold, the feelers also being used as ropes to drag the huge victim along. Every now and then some change would take place, the tired ants being relieved by others, many walking backwards as well as forwards. When arrived at the hole, and they found the cockroach too large for admission, they speedily dismembered it, and the falling wings, &c., were soon brought up again by fresh detachments, till the whole was safely stored. At such times the words of Solomon have forcibly occurred to my mind: 'The ants are a people not strong, yet they prepare their meat in the summer. Go to the ant, thou sluggard; consider her ways, and be wise.'"

Of the white ants of Ceylon, Percival says:—"In the space of a night they will demolish and eat up all the boots, shoes, and bottoms of trunks which come in their way, or are left on the ground. This is never done but by the carelessness of the black servants. In camp, the furniture of the tents is placed on inverted bottles, with their necks planted in the ground, which, on account of the slippery nature of the glass, cannot be climbed up by the ants. In the dwelling houses, the trunks, chairs, and bed-posts are for the same reason placed in tin vessels full of water. I have frequently seen the large beams of a house almost eaten through by these insects, and ready to tumble down on the heads of the inhabitants.

VESPA GALLICA.

"This destructive insect, however, is not without the most singular utility, and is made by the Creator to serve the same benevolent purposes which are conspicuous in every part of his plan. In the immense forests which they inhabit, and which are never subject to the hand of cultivation, the constant accumulation of decayed timber would in time greatly impede, if not entirely choke vegetation, were not these animals employed by Providence continually to devour it."

Insects, indeed, tiny and insignificant as they may appear, are in such cases the principal scavengers of Nature; and wherever decaying vegetable or animal substances abound, on land or in water, there myriads of insects are certain to be met with, greedily devouring what is most noxious in quality, and offensive to our senses. At the same time, the multiplication of their numbers, from this abundant supply of food, provides an almost exhaustless store of prey for those species of birds which feed upon insects.

Of all insect delicacies in Africa, the white ants, or termites, are in highest esteem. These ants, especially at the swarming season, are actively collected. They are then about half an inch long, as thick as a crowquill, and very fat. When roasted they somewhat resemble grains of rice. An idea of the esteem in which this dish is held may be formed from the expression of a native, when in conversation with Dr. Livingstone, on the banks of the Zouga:—"The Bayeiyé chief," he says, "visiting us while eating, I gave him a piece of bread and preserved apricots, and, as he seemed to relish it much, I asked him if he had any food equal to that in his country. 'Ah!' said he, 'did you ever taste white ants?' As I never had, he replied, 'Well, if you had, you never could have desired to eat anything better.'" The general way of catching these insects is to dig into their mounds, and wait till the builders come forth to repair the damage. They are then brushed off into a vessel, much in the same manner as the ant-eater brushes them off with his long, slender, flexible tongue into his mouth.

WASPS.

Another family may now be noticed.* Among these are the Wasps, so well known. The wings of all the insects it contains have a strong general resemblance. When at rest they fold their wings throughout the entire length. The bodies of the wasps are usually black, with yellow markings; the males differing from the females, in having the clypeus not marked with yellow spots. The females and neuters are provided with a powerful sting. Their legs have no apparatus for the collection of pollen.

The habits of the Solitary Wasps, each species of which comprises males and females only, are interesting. One of them† makes a hole, several inches deep, in the sand, or in the sides of walls, constructing a tube of earthy paste, at first straight, and then curved at its entrance. In this burrow it constructs its cells, and deposits in the cavity of the interior cell from eight to twelve little green caterpillars, arranging them spirally, in layers above each other. In the midst of these it deposits its eggs, and then closes the mouth of the hole with the materials of the tube, which it had used as a sort of scaffold. The larvæ, when hatched, feed on the green caterpillars.

The Social Wasps are composed of females, males, and neuters, or workers. The females are usually largest, but of these there are two sizes; one very much larger than the neuters, and laying eggs which produce two sexes; while the other is about the same size, and lays only male eggs. The larger kind are produced later than the workers, and come forth to be queens, and to found new colonies in the following spring.

Destined to become the monarch of a populous state, the queen-mother is at first an outcast and alone. Industry effects her greatness. With instinctive ambition, ere her subjects are born, she lays the foundation of the metropolis of her kingdom, building the first houses herself. She then gives birth to their first inhabitants, whom she feeds and nurses without assistance.

"At length," say Kirby and Spence, "she receives the reward of her perseverance and labour; and, from being a solitary and unconnected individual, in the autumn is enabled to rival the queen of the hive, in the number of her children and subjects, and in the edifice which they inhabit: the number of cells in a vespiary sometimes amounting to more than 16,000, almost all of which contain either an egg, a grub, or a pupa, and each cell serving for three generations in a year, which, after making every allowance for failures and casualties, will give a population of, at least, 80,000. Even at this time, when she has so numerous an army of coadjutors, the industry of this creature does not cease, but she continues to set an example of diligence to the rest of the community. If, by any accident, before the other females are hatched, the queen-mother perishes, the neuters cease their labours, lose their instincts, and die."

A community of wasps and its nest are called a vespiary. In some instances they are small, as in the one called *Vespa gallica.* In a large one there are several hundred females, of which few survive the winter. The survivors fly about in spring, actively engaged in preparing for their future colonies. Once established, they never quit the nest. In their youth, they emerge from the pupa towards the end of August, and at the same time with the males. They pair in September and October. The males are about equal in number with the females. Their habits are industrious, and not, like those of drones, luxurious and lazy. They are the street-sweepers and undertakers of their city. They carry off the rubbish and the bodies of the dead, which, if too heavy for their strength, they quarter, and carry away piecemeal. Their lives are peaceful, and they die a natural death at the close of the year, when the cold destroys both them and the workers.

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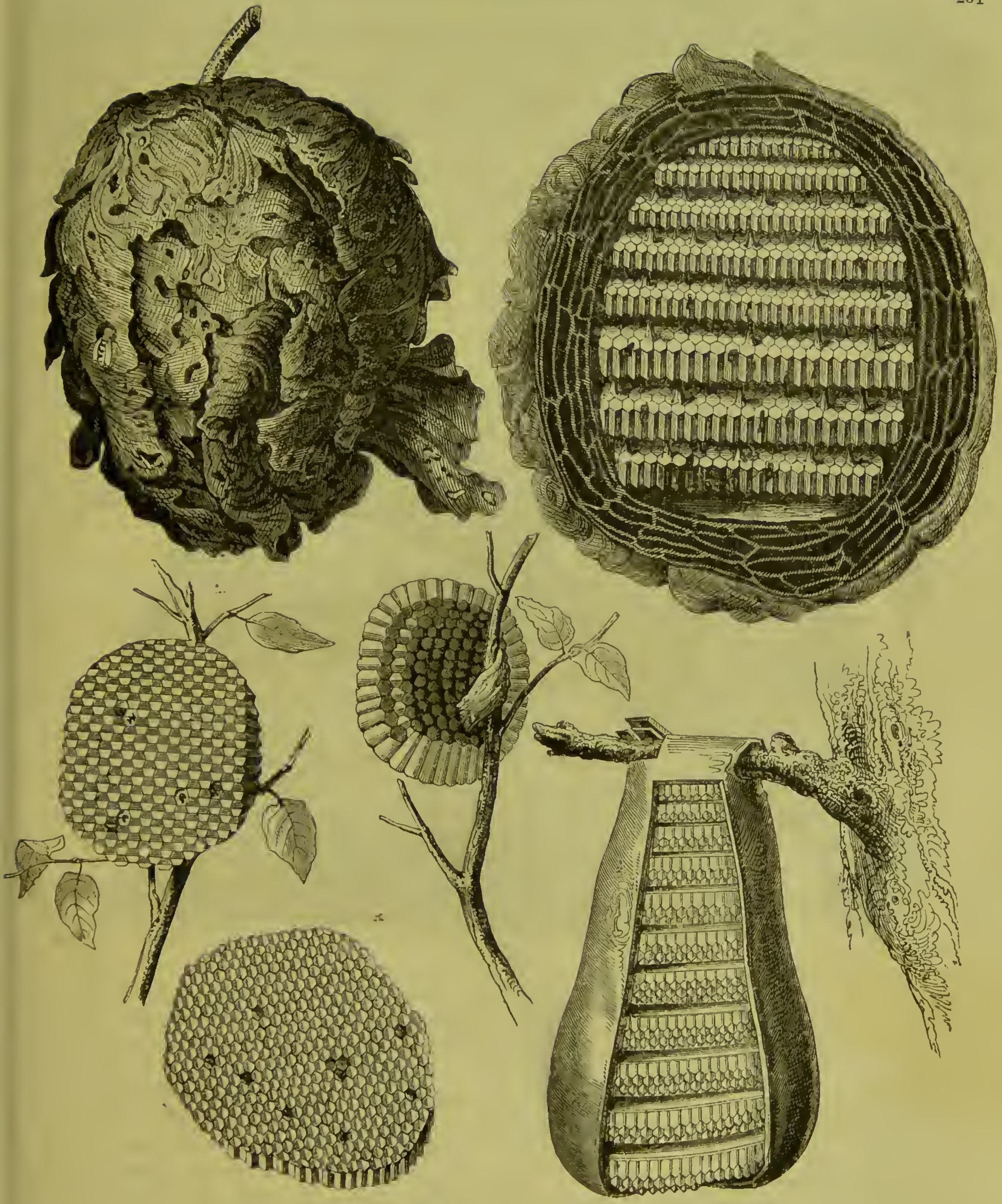
* Vespidæ.

† Vespa muraria.

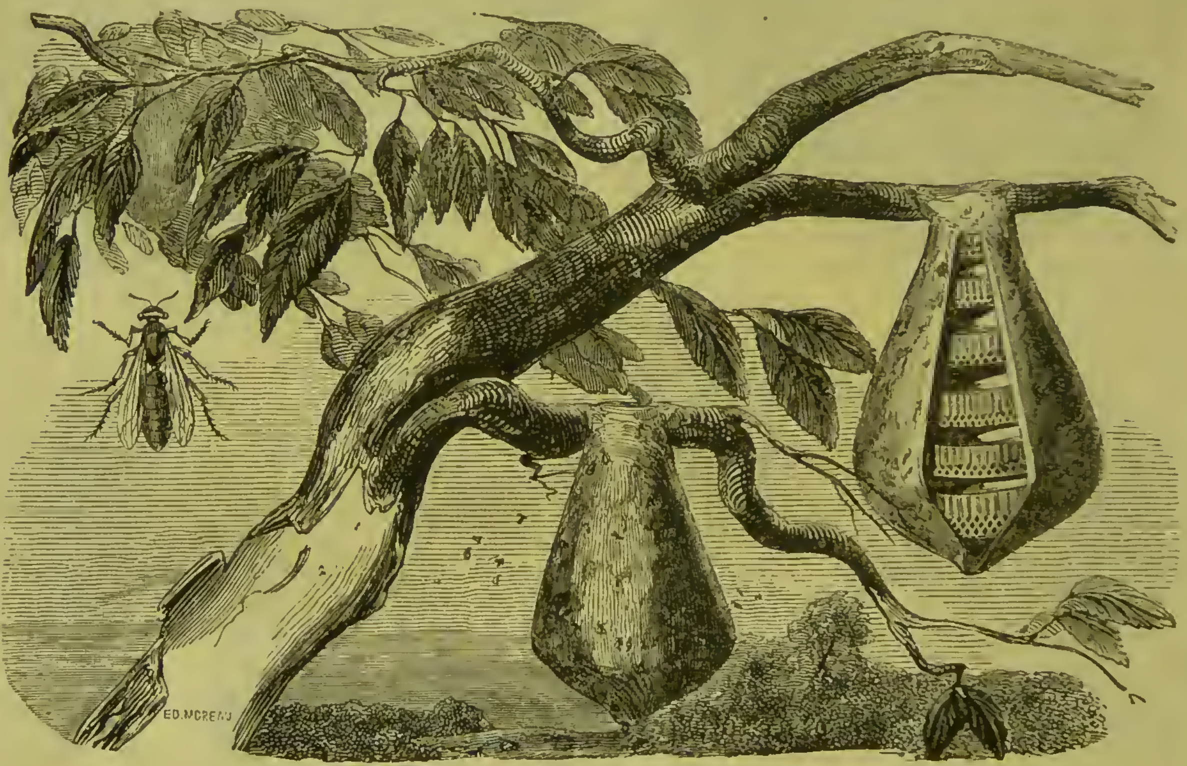


WASPS' NESTS.

The neuters are the most numerous and busy class of the vespine community. They are the architects, soldiers, and commissaries of the state. They build the nest, gather provisions, regulate the nurseries, and revenge insults. They levy contributions wherever they can, and fight for their spoil if disturbed. Robbers and ferocious enemies of the rest of the world, they are faithful servants of the commonwealth of which they are members. The food they collect is shared among all with impartial justice.

The worker having brought home his spoil, perches upon the top of the nest amid his assembled companions, and disgorging the sweets he has collected, fairly distributes them. When not occupied on foraging expeditions, the neuters are employed in the enlargement and repair of the nest. Celerity and order prevail in all their operations.

Each of the masons has his allotted space, an inch or an inch and a half in extent, wherein he conducts his plastering occupation, his mouth serving as a hod, carrying a ball of ligneous fibre, previously torn by his powerful jaws from gate-posts, wood-blocks, and neighbouring trees. This fibre, kneaded together and moistened with saliva, is made into a paper, of which are constructed the combs, each made up of a number of hexagonal cells, opening downwards. The outside of the whole nest is covered with foliaceous or leafy layers. It is probable that the substance of the comb is made from the scrapings of sound wood; that of the envelope from a mixture of sound and decayed.



TREE WASPS.

The nests of the Tree Wasps are finest and closest in texture, which is necessary, as they are so much more exposed to the vicissitudes of the weather than those which are buried in the ground. Some foreign species construct their nests of a solid and thick pasteboard, impenetrable to the rain; others diversify the outsides of their habitations with conical knobs of various shapes and sizes, supposed to be defences against their larger enemies, and construct pent roofs to protect the entrance from the wet, the entrance hall being so twisted as to prevent the invasion of hostile insects.

A Brazilian species makes honey. A Demerara wasp suspends its nest by a ring from the uppermost branches of trees, so as to be out of the reach of monkeys. In the collection of the Zoological Society is a wasp's nest from Ceylon, built inside a great palm-leaf, and not less than six feet in length.

A pensile nest of a small species from South America exceeds anything of the kind we have ever examined. Its shape is that of two cones, a larger and smaller, united at their bases. The external wall is composed of firm, tough, white paper, thicker than a stout card, which bears writing-ink without its running, and is smooth, and of uniform consistence. This exquisite nest is attached to the branch of a tree, from which it hangs, with the aperture for the admission of the colony at the lower apex. The situation thus chosen, in addition to the position of the aperture, together with its smallness—for it is not capable of admitting anything much larger than the body of the insect—renders the nest impregnable by such enemies as would be likely to covet the larvæ for food; and, indeed, the strength of the fabric itself is a security against the attacks of birds, snakes, or even small mammalia. The total length of the nest is nine inches; the diameter at the widest part, where the bases of the cones join, six.

The cells of the comb of the common English wasp are brown, and coarse in texture; but where the larvæ have spun their cocoons, they are found lined with a white and semi-transparent paper, fashioned on the mould of the cell, and probably made by the larvæ themselves.

Wasps have sentinels placed at the entrances of their nests to give an alarm in case of danger. If their guards are seized and destroyed, the rest do not attack. It has been observed that if a nest of wasps be approached without alarming the inhabitants, and all communication be suddenly cut off between those out of the nest and those within it, no provocation will induce the former to defend it and themselves. But if one escapes from within, it comes out angrily, as if commissioned to avenge the wrong, and will sacrifice its life in defence of the community.

"About the beginning of October every wasp-nest," says Captain Brown, "presents a strange scene of what appears anomalous cruelty. The wasps then not only desist from bringing nourishment to their young, but also drag them in the caterpillar state from their cells, and expose them to the weather, where they either die for want of food, or become a prey to birds; or, as is more generally the case, the parent wasps pinch them to death with their forceps. But instead of being cruel and unnatural, this is, perhaps, an act of mercy, as wasps do not lay up a store of food for the winter, and their progeny would consequently die a painful and lingering death from starvation if left in their cells."

APIS MUSCARUM.

The Hornet is a familiar example of the same family. It constructs its nest of a coarser substance than that used by the common wasp, and has a sting of similar power.

The name Bee is common to all the species of a very numerous tribe of insects. Kirby, in his beautiful monograph, "Apum Angliæ," divides them into two groups—*Apis* and *Melitta*, which differ principally in the proboscis. We give an instance of a fly-like bee, *Apis Muscarum*.

Caterpillars often display great ingenuity in the construction of their nests. Thus, the one represented has rolled up a leaf, which he has thus formed into a comfortable domicile. But the perfect insect is equally successful in a variety of ways. Thus, the Roseleaf-cutter Bee makes a nest of portions of leaves, which is sometimes eighteen inches long. The pieces for this she cuts off most accurately, forming what is like a set of thimbles, put one upon another, and inclosed in a case; and then she prepares a round piece to close it, so that being filled with honey, and placed horizontally, not a drop can escape. "Truly," as Reaumur has remarked, "whether this is attained by instinctive or intellectual means, the glory is due to that Intelligence which makes them and us."

Others are called Masons. These build cells of agglutinated sand, road-stuff, clay, and similar materials, in the crevices of walls or brickwork; sometimes in clusters, sometimes isolated, according to the species. "For some days," says a recent writer, "have we been watching the labours of a mason bee in our garden. It has fixed upon a rough depression in one of the coarse bricks of the wall, which accident led us to notice. We saw the bee enter an orifice, and, on looking more narrowly, discovered that this orifice led to a deep cell, so built as to level the surface of the brick, and efface the appearance of any fissure or cranny. The orifice is not so large in circumference as a small pea, but it admits with ease the body of the laborious mason. It leads into a tube, of about three inches in length, fitting the crevice, and is constructed of mingled particles of crumbled brick and mortar, evidently agglutinated by viscid saliva. Probably it is divided into several stories, each story being a single cell for an egg, and an accompanying supply of food; but we content ourselves for the present with a close surveillance. This morning the orifice is closed up, the bee is not to be seen; and had we not marked the brick, we should have been unable to find the cunningly constructed hive, if we may so call it."

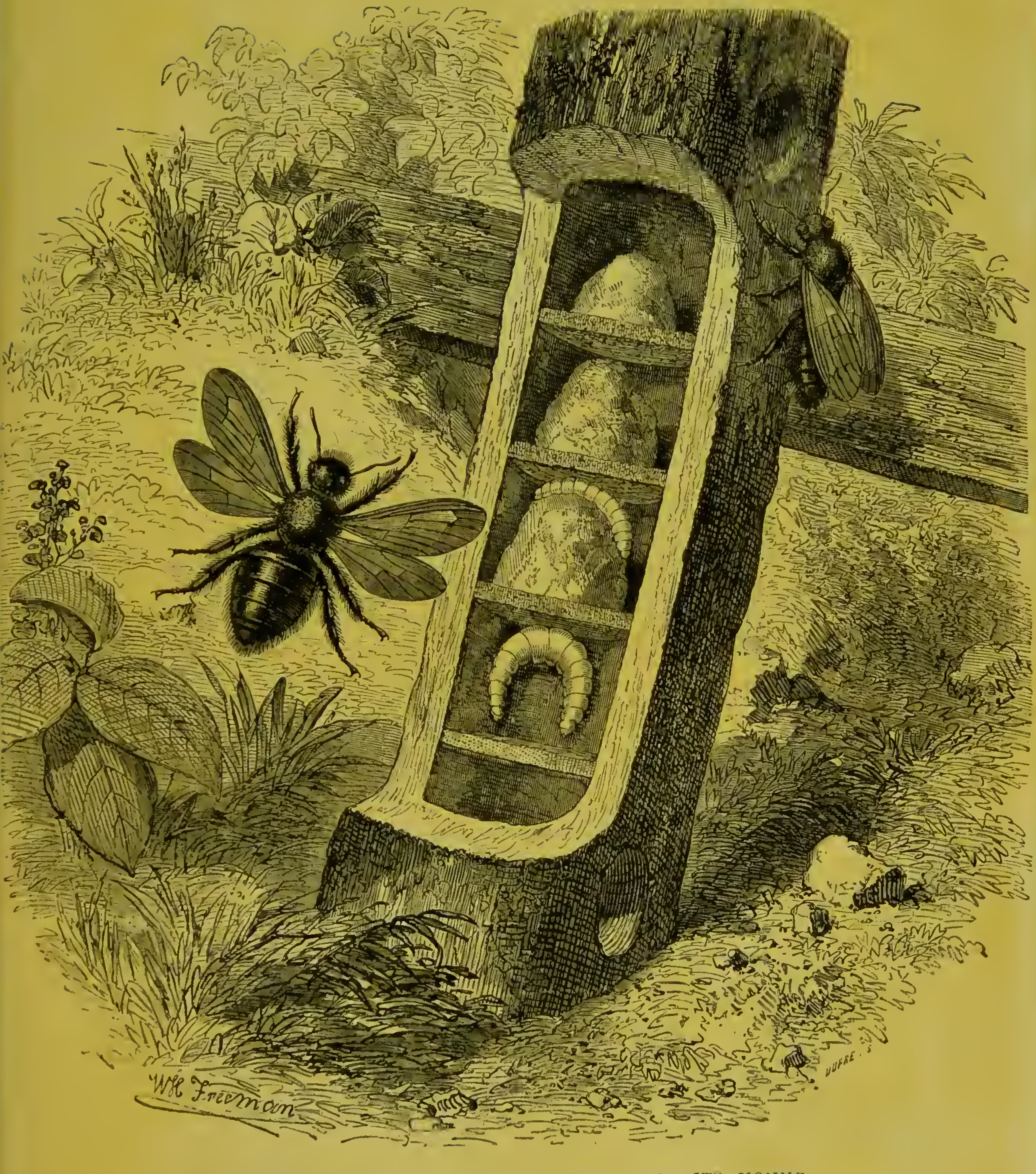
CATERPILLAR'S NEST.

ROSE-LEAF-CUTTING BEE'S NEST.

The female carpenter bee has a task to perform no less arduous than the mason bee; for, though the wood may be tolerably soft, she can only cut out one small portion at a time. She flies away with her fragments of wood, but varies the direction of her flight every time; and when she drops a chip of wood which she has carried off, she makes a circuit of some extent before wheeling round to go back.

So it was in one instance which was particularly observed. The writer says:—"On observing the proceedings of this carpenter bee next day, we found her coming in with balls of pollen on her thighs; and, on tracing her from the nest into the adjacent garden, we saw her visiting every flower which was likely to yield her a supply of pollen for her future progeny. This was not all. We subsequently saw her taking the direction of the clay quarry frequented by the mason bees, where we recognised her loading herself with a pellet of clay, and carrying it into her cell in the wooden post. We observed her alternating this labour for several days, at one time carrying clay, and at another pollen, till at length she completed her task, and closed the entrance with a barricado of clay, to prevent the intrusion of any insectivorous depredator, who might make prey of her young, or of some prying parasite, who might introduce its own eggs into the nest she had taken so much trouble to construct.

"Some days after it was finished, we cut into the post, and exposed this nest to view. It consisted of six cells, of a somewhat square shape, the wood forming the lateral walls; and each was separated from the one adjacent by a partition of clay, of the thickness of a playing-card. The wood was not lined with any extraneous substance, but was worked as smooth as if it had been chiselled by a joiner. There were five cells, arranged in a very singular manner—two being almost horizontal, two perpendicular, and one oblique."



THE CARPENTER BEE: ITS NEST AND FOOD FOR ITS YOUNG.

THE HONEY BEE.*

This interesting insect always lives in society, with many of its own species. In its natural state it generally constructs its nest in hollow trees; but throughout Europe it is now rather a rare occurrence to find it otherwise than domesticated. Each society, or swarm, is composed of three descriptions of Bees—the Male, or Drone; the Neuter, or Worker; and the Female, or Queen.

THE DRONE.

THE WORKER.

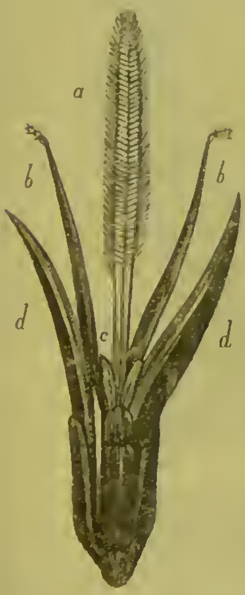
THE QUEEN.

The drone, or male bee, is, in general form, almost cylindrical, the separation between the thorax and abdomen being much less distinct than in the females or neuters. The eyes are very large; the antennæ are thirteen-jointed; the thorax is thickly covered above and beneath with short, pale-brown hairs, resembling velvet; the legs are black; all the claws are divided, the inner part being nearly equal in length to the outer part; the wings are large, and rather longer than the body.

The drone may be readily distinguished from the queen and workers by its greater breadth, its large eyes, which meet at the top of the head, and the abdomen having only four segments visible from the upper side. The wings are much larger in proportion than those of the worker or the queen.

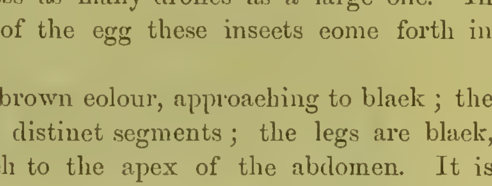
The number of drones in a hive varies from six or seven hundred to two thousand; but this diverse proportion is not regulated by the number of bees, for a small swarm will sometimes possess as many drones as a large one. In about twenty-four days from the laying of the egg these insects come forth in the winged state.

The neuter, or worker, is of a dark-brown colour, approaching to black; the abdomen is conical, and composed of six distinct segments; the legs are black, and the wings, when closed, nearly reach to the apex of the abdomen. It is twenty-one days in existence; that is, from the time the egg is laid until the insect has attained its perfect state. The number of workers in a well-stocked hive is about 15,000 or 20,000. Their occupation is to collect honey, pollen, and propolis, to build the combs, and attend upon the young.



a, The Ligula; *b*, Labial Palpi, or Feelers; *c* and *d*, Maxillæ, or Lower Jaws.

If we examine the proboscis of a bee through a lens of very moderate power, we find that it is composed of five distinct parts: a central stalk and four lateral ones—two on each side. The central part is that which is principally employed in collecting honey; it is not perforated, but is a flat, cartilaginous substance, and is used as a tongue in lapping up the honey, which is then conveyed to the pharynx, and is afterwards disgorged into the cells of the comb, part being used for the purpose of feeding the young, and the remainder stored up for the winter's consumption.


HIND-LEG OF THE BEE, SHOWING THE CAVITY IN WHICH THE PROPOLIS IS COLLECTED.

The legs of some bees are distinguished in the sexes by a difference in their clothing. A singular apparatus has been given to the worker bees for the purpose of carrying the propolis (a brown, odoriferous, resinous substance, more tenacious and extensible than wax, and well adapted for cementing and varnishing), as well as the pollen of flowers, to the hive. The shin, or middle portion of the hind pair of legs, is actually formed into a triangular basket, admirably adapted to this design. The bottom of this basket is composed of a smooth, shining, horn-like substance, hollowed out in the substance of the limb, and surrounded with a margin of strong and thickly-set bristles—a structure belonging only to the females and neuters, and which will be in vain looked for in the male. Whatever materials may be placed by the bee in the interior of this basket, are secured from falling out by the bristles around it, whose elasticity will even allow the load to be heaped beyond their points without letting it fall.

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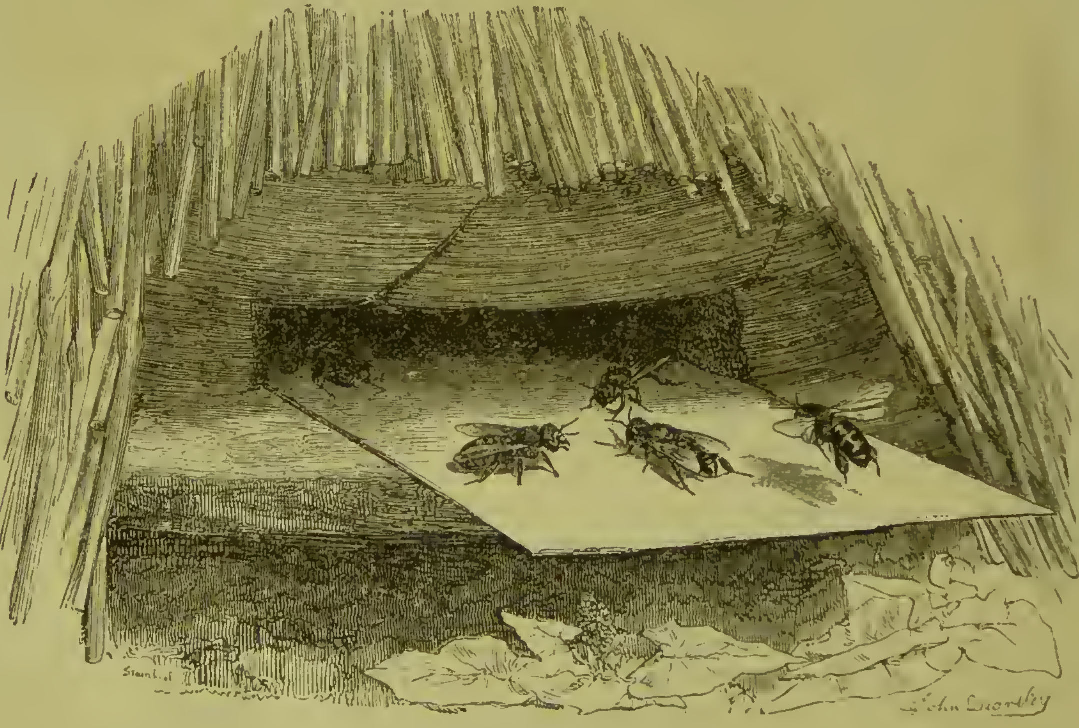
* Apis mellifica.

Mr. Knight caused a part of a tree stripped of the bark to be covered with a cement, composed of bees'-wax and turpentine, and he observed this was frequented by hive-bees, who finding it to be a very good propolis ready made, detached it from the tree by their mandibles or jaws, and then, as usual, passed it from the first leg to the second, and so on. When one bee had thus collected its load, another often came behind and took it away; a second and third load were lost in the same manner; thus furnishing, perhaps, an instance of the division of labour which is so strikingly exemplified in every part of the economy of bees.

It is also worthy of remark, that when the bee is loading her singular basket, she first kneads the piece she has detached with her mandibles, till it becomes somewhat dry, and less adhesive, as otherwise it would stick to her limbs. This preliminary process sometimes occupies nearly half an hour. She then passes it backwards by means of her feet, to the cavity of her basket, giving it two or three pats to make it adhere; and when she adds a second portion to the first, she often finds it necessary to pat it still harder. When she has procured as much as the basket will conveniently hold, she flies off with it to the hive, unless relieved of it in the way that has just been described.



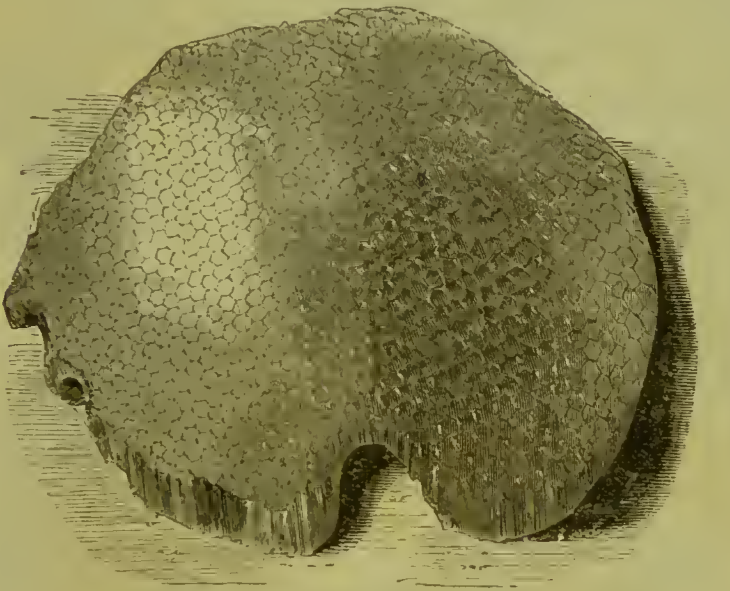
WORKING BEES.

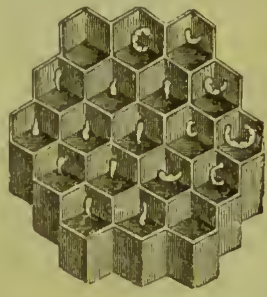
The queen bee is of a dark brown colour, and provided with a bent sting; while in the neuter the sting is straight, and the male has no sting. The queen bee resembles the worker in the shape of the head and thorax; but the great length of the abdomen, and the paler colour of the legs and antennæ are its chief distinguishing characteristics. There is but one queen in a hive, who is treated with the greatest attention by all the other bees. If, by accident, the queen be killed, or if she die, her dead body is still treated with attention, and for a time is preferred to any other queen.

The sole occupation of the queen is to lay eggs in the various cells prepared by the workers for that purpose, for she takes no care of the young herself until she is about eleven months old; the eggs laid are nearly all such as will turn to workers, but at the completion of that period, which most frequently happens in spring, the queen commences the great laying of the eggs of males. At this time she will lay from 2,000 to 3,000 eggs, sometimes from forty to fifty a day being laid during the months of March and April. There is also another laying of eggs in the autumn, but this is not so considerable. In the interval the eggs of workers are almost exclusively laid.

The interior of a hive consists of a number of combs arranged perpendicularly; these are fixed to the roof of the hive, and are parallel to each other, the space between them being about half an inch. When the first comb has advanced in size, so as to consist of two or three rows of cells, two other combs are commenced, one on each side of it, the work proceeding as in the first; these again are followed in their turn by two others. As the comb advances in size it assumes a form nearly circular, and is still joined to the roof of the hive only; the work proceeds by adding wax to the margin of the comb, exactly at the juncture of the opposing cells, and this is no sooner deposited than it is cut away and worked into cells. These cells are not equally deep throughout the comb, but their depth gradually decreases as they approach the margin. A comb in its progress has the form of a double convex lens.

The form of the comb, as above described, is that of a new one; but in the honey-storing season the sides of the comb are joined to those of the hive, to give strength to hold the additional weight. The cells are also lengthened, so that the surface of the comb then becomes even. The cells are not quite horizontal, the orifice being generally a little higher than the base, most commonly four or five degrees, but sometimes considerably more. When a comb is first completed, it is of a weak substance, and a dull white colour; it is, however, soon strengthened by adding propolis to the margin of the cells, and lining their interior with the threads of the same material.


HONEYCOMB.


CELLS WITH THE LARVÆ.

CELLS OF WORKING BEES.

The cells of a comb are used for the purposes of storing up honey for the winter, and in them the larvæ are reared. Pollen, or bee-bread, is also stored up in some of the cells. Many larvæ may be reared in the same cell, and as each spins a web or cocoon on its sides which is never cleaned out, it thus becomes at last too contracted to contain larvæ; it is then used for one or both the purposes above mentioned. When a hive is well stored with combs having empty cells, the workers disgorge the honey into these receptacles; but in case cells are wanted they retain the honey, and wax is secreted for the purpose of building more combs. Honey is never consumed but in cases of the greatest necessity; as soon as a cell is filled, it is sealed up with a waxen covering.

Wild unclaimed honey bees, not however all of the same species, are found widely spread throughout Europe, Asia, Africa, and America, and also Australia. It would be difficult, however, in the present day to find such bees in our island; yet we have known stray swarms to take up their abode in old church towers, and beneath or among the beams and rafters of antique and dilapidated houses. Once it was otherwise; in fact, tradition, as M. Augustin Thierry observes, informs us that our island was primitively called the Country of the Green Hills, then the Island of Honey, and thirdly the Island of Bryt or Prydyn, from the latinisation of the latter of which words springs the modern name, Britain.

For, days gone by, when the axe had not laid low the vast forests which spread over so great an extent of country, and the wolf, the boar, and the wild bull were objects of the chase, wild bees abounded, and as a Roman poet expresses it, the oaks dripped honey.

THE HUMBLE BEE.*

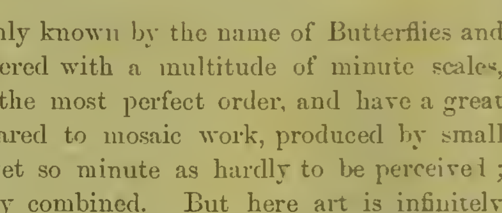
This well-known creature belongs to a large genus. M. le Comte Saint-Fargeau states that the female, having collected a quantity of pollen and honey, forms these substances into a ball, in which the eggs are deposited: so that, when the eggs are hatched, the larvæ are surrounded by the substance which serves them both for food and protection. When full-grown, each larva incloses itself in a silken cocoon, of an oval form, and placed always in a perpendicular position. The workers, on undergoing their final transformation, enlarge the nest, and attach to it an inner coating of wax. Wax is also used in the construction of little cells for the reception of honey. Huber says that each species makes these cells in a different manner.

SCALE-WINGED INSECTS.†

This Order is composed of those insects which are commonly known by the name of Butterflies and Moths, possessing four wings, usually of large size, and covered with a multitude of minute scales, which, to the naked eye, appear like powder, are placed in the most perfect order, and have a great diversity of beautiful colours. They have been well compared to mosaic work, produced by small pieces of variously coloured glass, stuck in a kind of paste, yet so minute as hardly to be perceived; looking rather like a picture whose parts are harmoniously combined. But here art is infinitely surpassed. A piece of the wing of a peacock butterfly, a quarter of an inch square, was placed under a microscope, when 70 rows, each containing 90 scales, were counted; there were, therefore, 6,300 scales, on one side of this small portion of wing, and a square inch must have the amazing number of 100,736 scales. The number of glass pins in a square inch of fine mosaic is only 870, so that it is 115 times coarser than the wing of this butterfly, which is of middle size, and the scales of which are proportional. What, then, must be the comparison with some of the smaller tribes, whose whole dimensions are a quarter of an inch!

The wing of a peacock butterfly, prematurely taken out of a chrysalis, proved to be nine and a quarter times finer than that of the perfect insect; so that it was 10,063 times finer than the most boasted mosaic.

These scales are of very different forms, and variously arranged, but mostly in an imbricated style, with more or less regularity. They are inserted into the membrane by a short footstalk or root, but that slightly, as they are brushed off with a touch. Not only are they often richly coloured, but they are marked with striæ, and often crossed by finer lines, and these striæ by the reflection of the light at different angles, produce varying tints of brilliant or metallic effulgence.



SCALES OF BUTTERFLY'S WING.

Some idea of the almost endless variety of form and markings which the scales of butterflies and moths assume, may be conceived from the fact that Lyonnet nearly fills six quarto plates with crowded delineations of one species of moth—the Bombyx Cossus. Leuwenhoek counted upwards of 400,000 on the wings of a silk-moth, and it is calculated that in one square inch of surface of a butterfly's wing, the number of scales will amount to about 100,740. When these scales are rubbed off, the wings are found to consist of an elastic, transparent, and very thin membrane, and when examined by means of a microscope, it will be found marked with indented lines, exhibiting the arrangement of the scaly covering.

At the top of the next engraving, on the left hand, is the small Tortoiseshell Butterfly,‡ abundant not only in England, but the neighbouring continent, and is conspicuous for its beauty and the lightness with which it flits from flower to flower. It closely resembles, except in size, the Great Tortoiseshell

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* Bombus terrestris.

† Lepidoptera.

‡ Vanessa urticæ.

BUTTERFLIES AND MOTHS.

Butterfly, which usually appears about the middle of July. It is rapid on the wing, often settling on the trunks of trees and dry pathways, delighting itself in the fervid rays of the sun. The colour of the wings above is dark orange-red, with a narrow vandyked edging of blue, and another of black, while its whole surface is variously and beautifully adorned.

Just beneath is the Fritillary, very elegant in its form. The fritillaries, for there are more than this one, are not only among the most common, but the most beautiful of the race, and are met with in woods and meadows, and on heaths and downs, in most parts of England, during June and July. In allusion to the wings of butterflies, it has been said, Nature has painted her canvas on both sides; the upper one being more delicately pencilled than the lower. But not so is it with the fritillaries, whose upper surface is reddish-brown and black, disposed in angular streaks or chequers; while abundantly and richly adorned is the reverse of their richly-scalloped wings. Often may one of these beautiful insects be observed in a garden,

> "Where he arriving, round about doth flie
> From bed to bed, from one to t'other border,
> And takes survey with curious, busy eye,
> Of every flower and herbe there set in order;
> Now this, now that, he tasteth tenderley,
> Ne with his feete their silken leaves deface,
> But pastures on the pleasures of each place."

A little below the fritillary, and towards the centre of the page, is the Cabbage Butterfly,* which appears in April and May; the wings are white above, with a large patch of black on the tip of the anterior pair. The under surface of the wings inclines to yellow, the lower being finely powdered with black; the upper wings have two conspicuous black spots.

Returning to the outer line, the Peacock's Eye is beheld, of a deep brownish red colour, inclining to purple, with a large eye-like spot on each wing above; beneath, the wings are dark shining brown, traversed by fine undulating lines of black. In the southern and midland counties of England this beautiful species is very common; but it is more rare in the north, and is seldom seen in Scotland. It usually appears in July, flitting about the hedge-rows, along shaded lanes, and about the borders of copses, alighting every now and then to sun its wings, and then again to start off on an aërial flight.

A little to the right of the cabbage butterfly is the Swallow-Tailed,† the largest of our indigenous butterflies. It is not, however, abundant; it has never been observed in Scotland, and seldom in the northern counties of England. In Cambridgeshire, it is said to be tolerably common in the fenny districts, and it has been observed in Sussex, Essex, Hampshire, Middlesex, and Kent. It does not appear on the wing in our island till the beginning of June. The female, as usual, exceeds the male in size. The general colour of the wings is black, powdered with yellow, and relieved by bold yellow markings, which colour, indeed, is spread over the basal half of the hinder wings. From the posterior margin of these projects an acute slip, which may be compared to the outer tail-feathers of the swallow, and at each inner corner is an ocellated spot of red, with an anterior crescent of light blue; the whole nearly surrounded by a ring of black. The body is black, covered with yellow hairs, which form a conspicuous line on each side of the thorax.

Above this is the Purple Emperor,‡ only to be found, and then not in abundance, in the oak-woods of the more southern counties of our island; and if beauty, strength of wing, fearlessness, and a lofty, bold, and vigorous flight entitle it to pre-eminence, it certainly stands at the head of our native butterflies. It seldom makes its appearance before the month of July, and may then be seen during the middle of the day, while the sun glows with meridian effulgence, soaring on rapid wings high over the summits of the tallest oaks, on the topmost twigs of which it settles for repose towards the approach of evening. The wings of this species are firm of texture: their general colour above is dark brown, changing in certain lights into rich purplish blue of metallic lustre, and relieved by marks of white. On the hinder wings, near the inner angle, is a small black spot surrounded by red; the under surface of the wings is rust brown, varied with white and black; an ocellated spot on both.

At the top of the engraving is the Orange-Tip Butterfly,§ which is tolerably common in our

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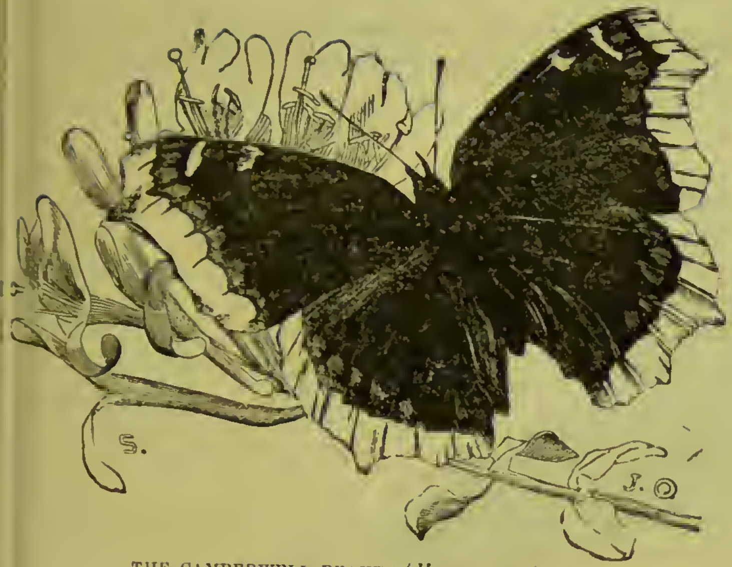
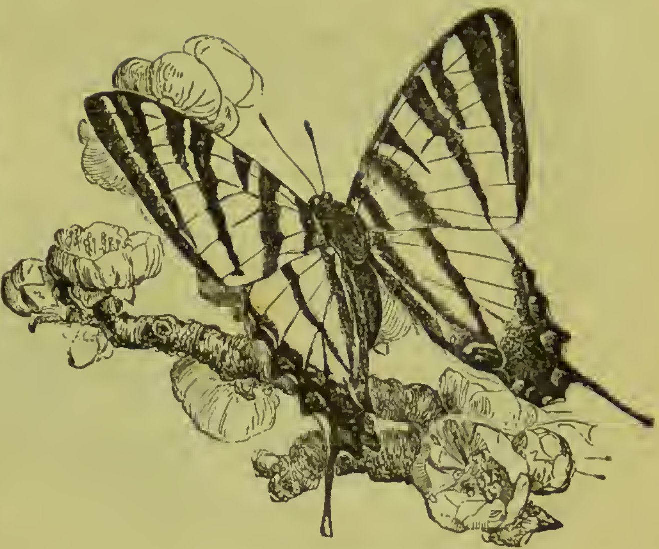
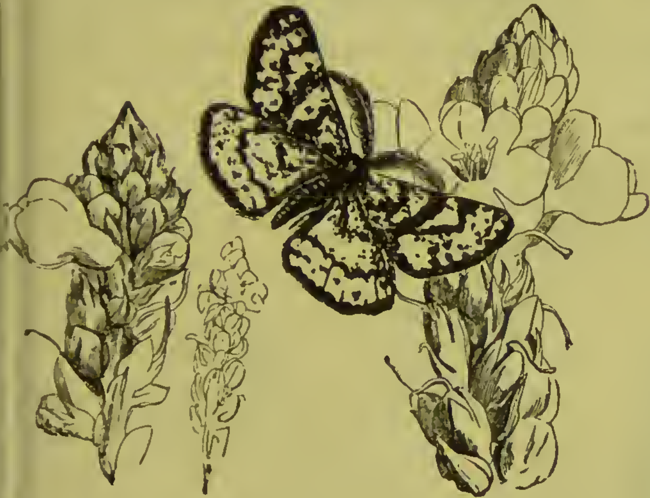
* Pontia brassicæ.
† Papilio machaon.
‡ Apatura iris.
§ Pontia cardamines.



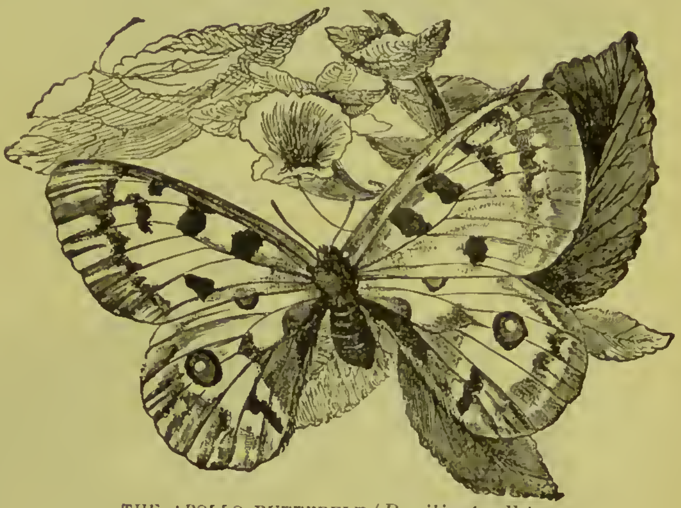
THE CAMBERWELL BEAUTY (*Vanessa antiope*).



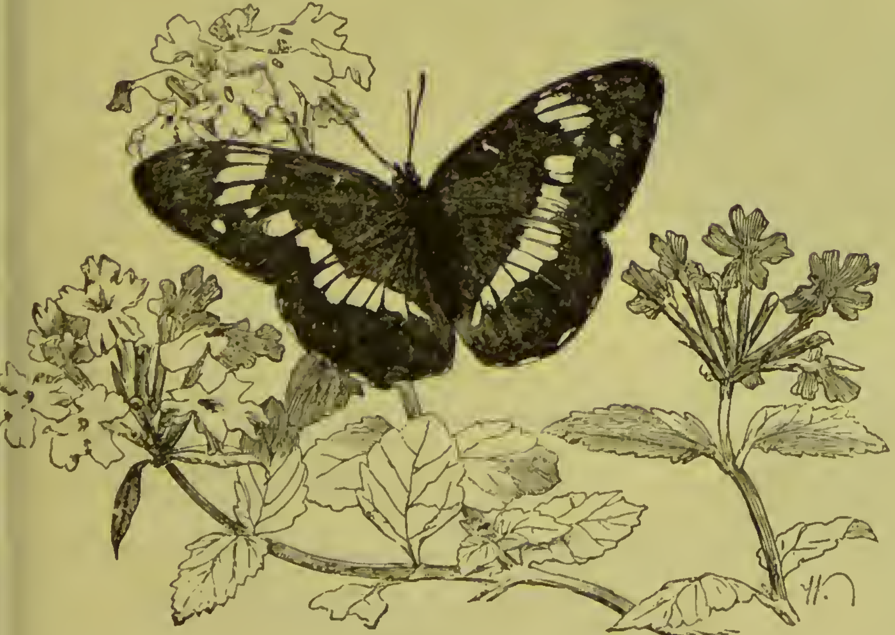
PAPILIO PODALIRIUS.



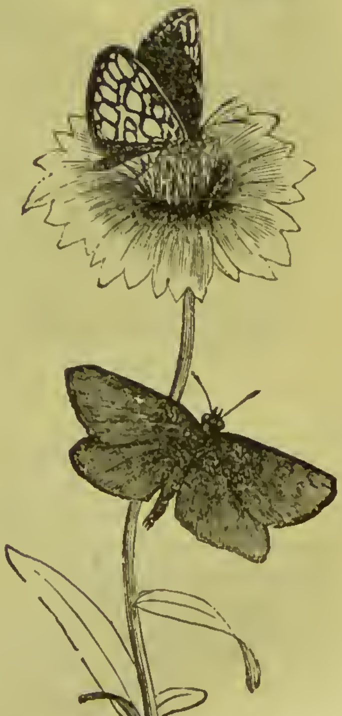
FIDONIA PLUMISTARIA.



THE APOLLO BUTTERFLY (*Papilio Apollo*).



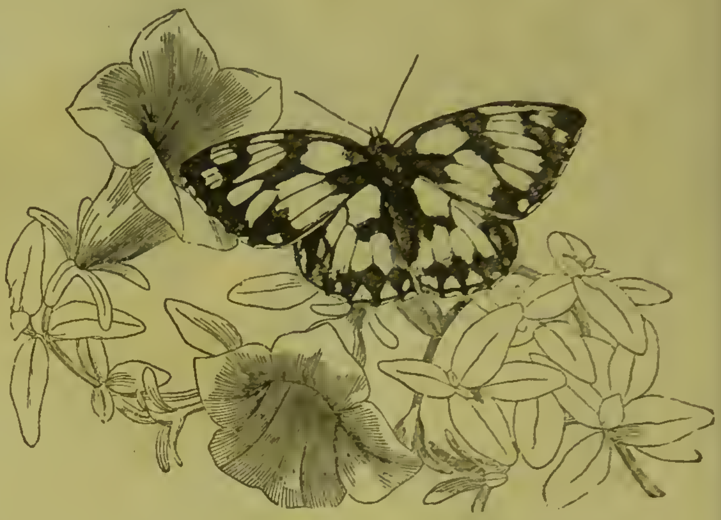
THE WHITE ADMIRAL (*Papilio sabilla*).



THE MIRROR BUTTERFLY (*Hesperia aracynthus*).

island, frequenting the borders of woods and lanes winding through a woodland but cultivated district. It usually appears about the end of May. The large or primary wings are white, dusky at the base, with a small, black crescent-mark in the centre, and a black tip. In the male the outer half of the wing is tinged with orange; in both, the hinder wings are marbled beneath with pale green; above they present faint tracings of the same. The larger figure is that of the red under wing.

The most superb of all the butterflies is the Imperial Trojan. It is a native of Amboyna, of an exceedingly rich green colour, having a fine golden tinge diffused through it; and "it may be doubted," says Linnæus, "whether Nature has produced any object more beautiful amongst insects." It measures upwards of seven inches and a half from the tip of one wing to that of the other.



THE MARBLED WHITE BUTTERFLY (*Papilio galathœa*).

MOTHS.

The muscular power of these insects is often very remarkable. The figure on the right of the page just alluded to is that of the Sphinx, or Hawk-Moth, associated with insects who, in the beauty, delicacy, and fulness of their plumage, and the marbled arrangement and blending of varied tints of brown, gray, black, and different tones of yellow, are not inferior in attractiveness to the more gaily painted butterflies that court the bright beams of summer.

NIGHT-MOTHS.

Like the owl, which so much resembles many of them in style of plumage, the moths generally remain concealed in their retreats during the day, quietly reposing till the growing darkness calls them forth to visit the dewy flowers, and revel in the enjoyment of existence, till the dawning day drives them to their wonted lurking-places.

This law of nocturnal life has, however, its exceptions, for we find one family to consist of species which are active only on the approach of evening or early in the morning, a few being as diurnal as the butterfly, and flitting in broad day from flower to flower in quest of honeyed food. This is the family of the Sphinxes, or Hawk-Moths.*

These insects are remarkable for their size, and the extent of their wings, which are extremely vigorous, and well adapted for rapid flight. Their name of hawk-moth was derived from the resemblance of their progression through the air to that of a hawk; but it is probably greater to that of some of the humming-birds. The remarkable attitude often assumed by the caterpillars, resembling that of the fabulous sphinx of the ancients, suggested to Linnæus the scientific term by which they are still denominated.

The Death's Head Hawk-Moth † appears to be distributed over our island, and Europe generally. Its thorax, so singularly bearing the figure of a human skull, has rendered it an object of terror to the superstitious. It varies from four to five inches in the expanse of its wings. The upper pair are brown, varied with black; the disc is marked with undulating lines of black and ferruginous patches, and powdered with white; the hind wings are fulvous orange with a narrow central and a broader indented bar running parallel with the hinder margin; the head and thorax brownish-black.

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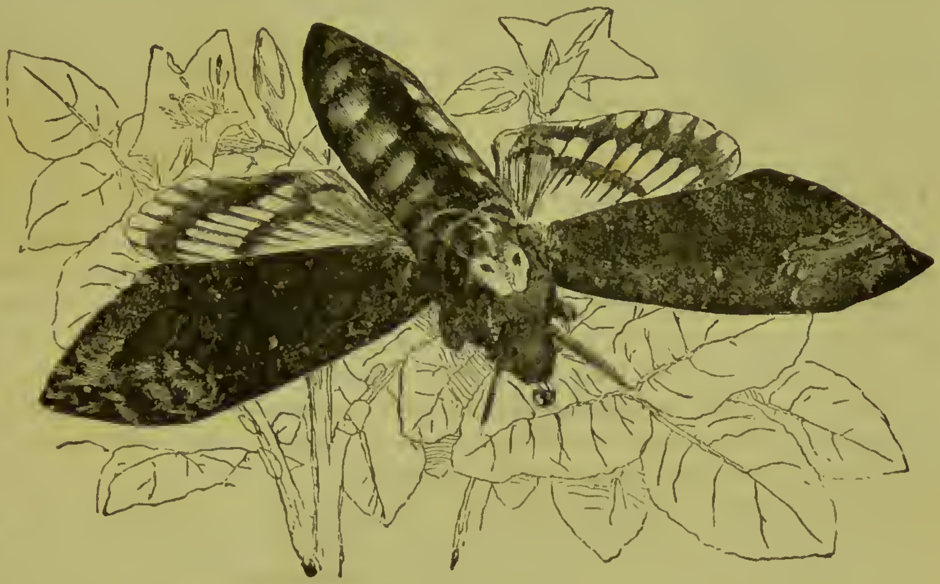
* Sphingidæ.

† Acheronta atropos. Sphinx atropos: Linnæus.

One of the most puzzling sounds to the inquirer is that of the death's head moth, when it is caught and kept a prisoner. Sometimes it is like that of a mouse, but much more piteous. Reaumur, after mentioning many experiments, concludes with the con-



DEATH'S HEAD MOTH.

SPHYNX FUCIFORMIS.

BEE HAWK-MOTH (*Sesia fuciformis*).

WHITE MOTHS.

viction that "in the more minute part of Nature's works there is always something which we cannot explain." He thought it most probable that the cry came from the head, perhaps from the mouth, or rather from the tongue, and it might be by the friction of the palpi against the tongue; for when he unfolded the spiral tongue with a pin, the cry ceased, but was renewed the instant it was coiled up again between the palpi. He then prevented the palpi from touching the tongue, which also stopped the sound, and when only one was permitted to touch it, the sound was much more feeble.

THE NEW AILANTHUS SILKWORM.

A NEW species of silkworm, under the above name, has recently been introduced in France, which promises to rival, if not supersede, that which has so long produced all the silk of commerce. Unlike the old species, which is known to be of delicate and tender constitution, and has of late been subject to a disease which has produced great mortality in the silk-producing districts, the Ailanthus worm is said to be more hardy and more easily reared.

The credit is due to Lady Dorothy Nevill, of Dangstein, for being the first to make known the perfect success of this hardy species of silkworm in this country. Her ladyship thus writes to the "Journal of Horticulture:"—"I am very much pleased with my worm success, and I have no hesitation in saying the worms might be hatched and brought up to their end by the commonest person, and without the slightest care, after they are placed on the leaves. We made a mistake in having standard ailanthus trees growing too far from each other. The poor worms descended the stems, in order to find food, and perished on the ground; whereas, were the trees planted like our copses, the worms would go from one to another without risk. I am certain that, in consequence of the little food (for we had to feed them on cabbages, which they ate very little of), they spun prematurely, and thus their cocoons are not so big as, under favourable circumstances, they would have been. I send you two as specimens. Next year I shall (D.V.) set about this new experiment in earnest. The worms themselves are most beautiful, very like the *Sphynx* (*Bombyx*) *ligustri*, of a bright emerald green, with turquoise blue spikes."

DOUBLE-WINGED INSECTS.*

THE insects of this Order are distinguished by having six legs, furnished with five-jointed tarsi, a proboscis, two palpi, two antennæ, three ocelli, and two halteres, or poisers. Some of them have no wings, but the striking characteristic of others is their having two wings only. The wings are generally horizontal in their position, and transparent; their nervures are not very numerous, and are for the most part longitudinally disposed. We take an example of the first family.†

FLIES.

THE HOUSE FLY.‡

THE favourite position of this insect, so common in England, is the window, on the panes of which it may be seen constantly walking up and down. The power which it possesses of walking on smooth, upright surfaces has, in consequence, been a frequent theme of conjecture, and of not a small amount of observation. Some have thought that these creatures have sponges on their feet, filled with a sticky substance, which enables them to adhere to such surfaces; and others, that this is done by the feet being beset with small bristles. Sir Everard Home found, however, that they have flat skins, or flaps, like the feet of ducks and other web-footed animals, and towards the back part or heel, but inside the skin or flap two very small toes, so connected with the flap as to draw it close down on the glass or wall where the fly walks, and to squeeze out the air between the foot and the glass or wall. The pressure of the external air would, therefore, hold it fast for a time, as a boy's sucker of leather adheres to a stone; and as he lets in the air that it may be detached, so would the fly when it wishes its foot to be disengaged.

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* Diptera.

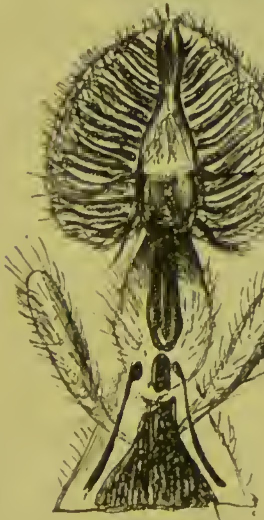
† Muscidæ.

‡ Musca domestica.

HOUSE FLIES.

Mr. Hepworth, who has recently examined the structure of the fly's foot, says:—"The flap varies in form in different species, from an irregular circle to that of an irregular triangle; and, viewing it from one side, it is somewhat thicker at the base (near its attachment), the under surface being, when isolated, convex, but perfectly flat as a whole, when applied to a surface of that form. It appears to be composed of an upper and an under layer of areolar tissue, or something similar to it, between which a bundle of tubes, along with the fasciculi of a large muscle, pass. These are placed at its base, and (sometimes protected by a 'coat of mail,' formed by long scales, overwrapping each other as a Venetian blind, or in alternate ones, as the scales of a fish, &c., but more frequently wanting) expand in a radiated form. Each tube, as it passes along with its fellows on each side, gives off a number of tubules alternately with them. These dip downwards from the under surface, and become expanded into trumpet-shaped extremities, the flap becoming thinner and thinner as it approaches its margin, which sometimes terminates in an irregularly serrated edge, and at others by finely-pointed hairs.

"The fly has the power of attaching itself to smooth surfaces by these trumpet-shaped extremities, and also of secreting a fluid from them, when vigorous, and it has occasion to make extra exertions; but in a partially dormant state (the best for making observations) it does not appear to be able to give out this secretion, although it can still attach itself; indeed, this fluid is not essential for that purpose. When it is secreted, it is deposited on the glass with great regularity. I have often attempted to preserve these markings by applying colouring matter whilst they were moist, but have not yet succeeded. The tubules are often seen protruding from under the margin of the flap, in a semi-arch-like form, giving it a fringed appearance."


PROBOSCIS OF A FLY.

CRANE-FLY (*Tipula oleracea*).

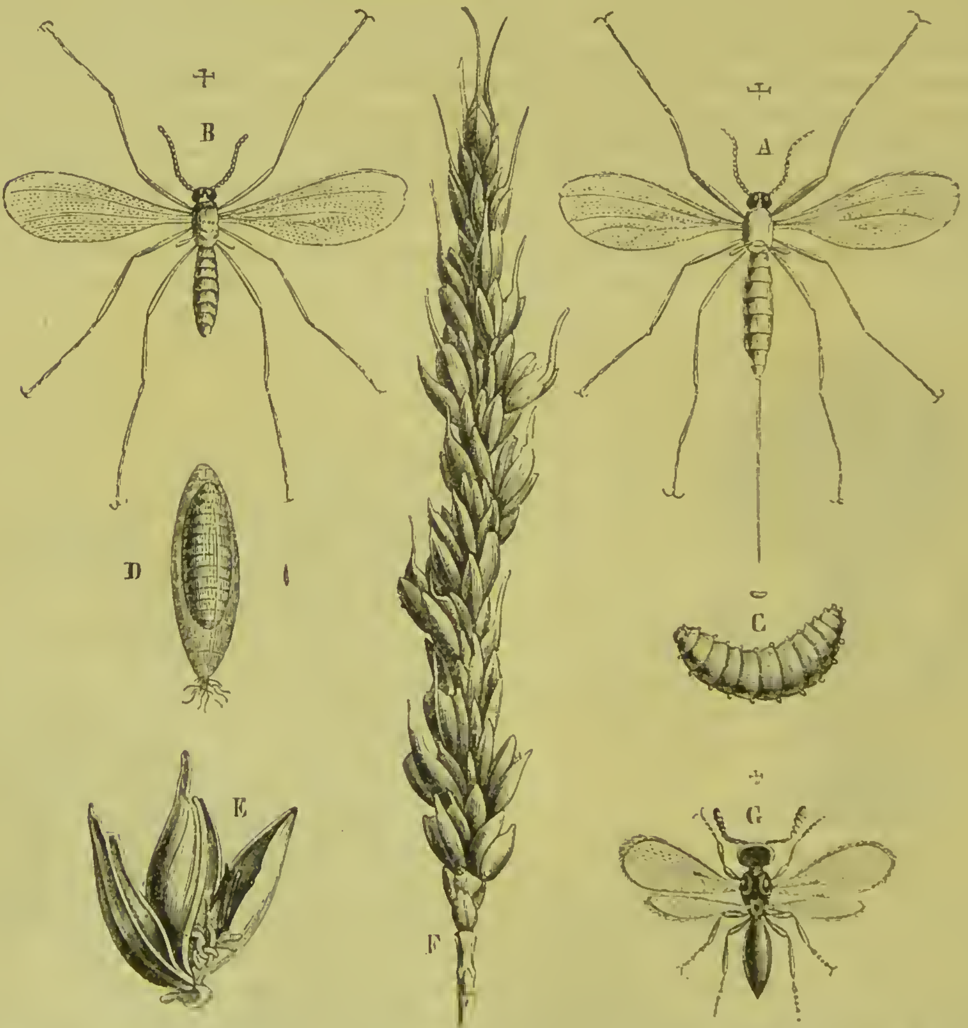
"How does a fly buzz?" is a question more easily asked than answered. "With its wings, to be sure," hastily replies one of our readers. "With its wings as they vibrate upon the air," responds another, with a smile, half of contempt, half of complacency, at his own more than common measurement of natural philosophy. But how, then, let us ask, can the great dragon-fly, and other similar broad-pinioned, rapid-flying insects, cut through the air with silent swiftness, while others go on buzzing when not upon the wing at all? Rennie, who has already put this posing query, ascribes the sound partially to air; but to air as it plays on the "edges of their wings at their origin, as with an Æolian harp-string," or to the "friction of some internal organ on the root of the wing nervures."

The larvæ of the flesh-flies, or those which prey on dead and decaying animal substances, constitute the "convocation of politic worms," which Hamlet describes as busy on the dead body of Polonius. In a similar assemblage, Barry Cornwall has introduced the larva of the goat-moth as the companion of the earth-worm:—

"Round him now the worms are met in council;
Cossus and Lumbricus are chosen presidents;
The one because he is a judge of learning,
And t'other has taste in flesh."

When Imogen, in the assumed character of Fidele, agrees to follow Lucius, she says:—

"But first, an' it please the gods,
I'll hide my master from the flies, as deep
As these poor pickaxes can dig."



A, FEMALE WHEAT-FLY. B, MALE WHEAT-FLY. C, LARVA. D, CHRYSALIS. E, GRAIN OF WHEAT DESTROYED BY THE LARVA. F, ATTACK ON A NUMBER OF GRAINS. G, PARASITE OF THE WHEAT-FLY.

Another insect[*] suggested a comparison to Washington Irving; for of the Baron Von Landshort he says, "he buzzed about every hall and chamber, as idly restless and as importunate as a blue-bottle fly on a warm summer's day; it is known at once by its large blue belly, and has sometimes been called a 'beef-eater.'"

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[*] Musca vomitoria.

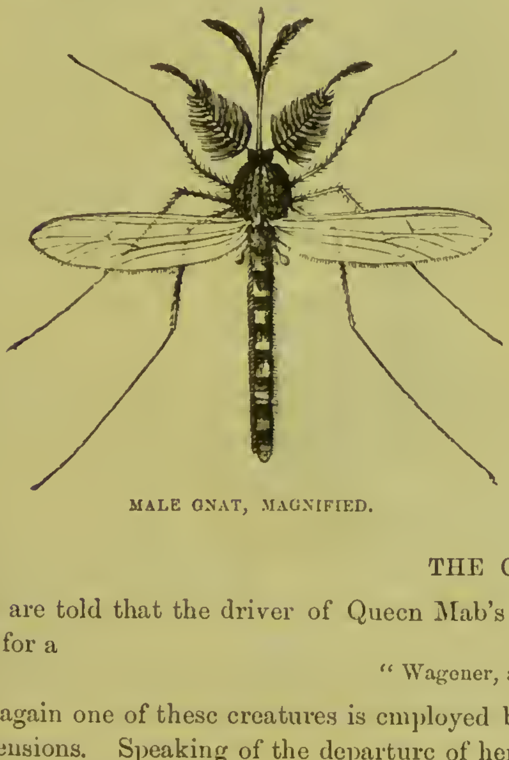
A familiar example of the second family* is found in the insect community known by the name of Daddy Long-legs. The *Terricoles* are the true Crane Flies, seen in damp meadows in great numbers, especially in the autumn. The larvæ are found in the soil, feeding on the roots of grass and other plants, and occasionally doing much mischief. Mr. Westwood remarks that the male daddy long-legs is very quarrelsome, and often fights with his brethren of the same species. It is an amusing sight to watch a fly of this kind, holding the body erect, while piercing the ground and depositing an egg; then moving an inch or two, and repeating the operation with untiring perseverance.

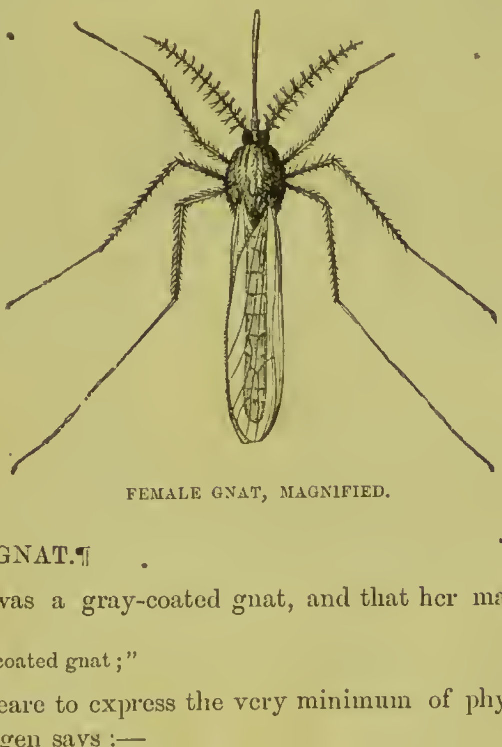
Another example is found in the worm known to anglers by the name of Blood-Worm. It is the larva of one of the species of this genus.† A third requires a more particular notice.

THE WHEAT-FLY.‡

This insect is about one-twelfth of an inch in length, and of a reddish-yellow colour; the wings are milk-white, and exhibit the prismatic colours in certain lights; the eyes are black. The Wheat-Fly may be observed sometimes in the greatest abundance flying about wheat fields in the month of June. It generally makes its appearance about seven or eight o'clock in the evening. It totally disappears by the end of June. The chief of the parasites that prey on the wheat-fly is the one represented in the engraving, *Inostemma punctiger*.

The fourth family § includes the gnats: the Common Gnat, and the Mosquito, || so troublesome in the West Indies.


MALE GNAT, MAGNIFIED.


FEMALE GNAT, MAGNIFIED.

THE COMMON GNAT.¶

We are told that the driver of Queen Mab's equipage was a gray-coated gnat, and that her majesty had for a

> "Wagoner, a *small* gray-coated gnat;"

and again one of these creatures is employed by Shakespeare to express the very minimum of physical dimensions. Speaking of the departure of her lord, Imogen says:—

> "I would have broke mine eye-strings; cracked them, but
> To look upon him, till the diminution
> Of space had pointed him sharp as my needle;
> Nay, followed him till he had melted from
> The smallness of a gnat to air."

And yet, small as it may appear comparatively, it sometimes produces formidable consequences. Reaumur says:—"I have seen in marshy districts on the sea-coast, individuals whose legs and arms were rendered shocking with the reiterated bites of gnats, and some of them so bad, that it was doubtful whether they could be cured without amputating a limb."

The sucker of the gnat is shown by the engraving to be of complicated structure.

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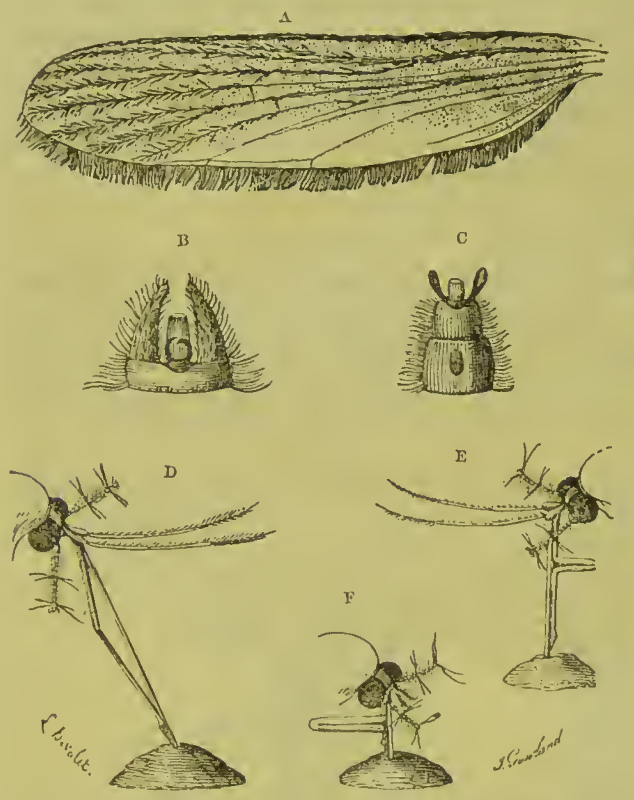
* Tipulidæ. † Chironomus plumosus. ‡ Cecidomya Tritici. § Culicides. || C. mosquito. ¶ Culex pipiens.

The instrument of annoyance in the Gad Flies * differs from that of the gnat; being much larger, more formidable, and not less skilfully adapted to its office. One of these is remarkable for its attacks on cattle. Thomson thus speaks of the effect produced by these creatures on a herd:—



A, WING OF THE GNAT, SHOWING THE NERVURES AND SMALL SCALES, LIKE THOSE OF BUTTERFLIES. B, TERMINATION OF THE MALE ABDOMEN. C, TERMINATION OF THE FEMALE ABDOMEN. D, E, F, MODES OF THE OPERATION OF THE GNAT'S SUCKER.

TABANUS BOVINUS.

"Tossing the foam,
They scorn the keeper's voice, and scour the plain,
Through all the bright serenity of noon;
While from their labouring breasts, a hollow moan
Proceeding, runs low-bellowing round the hills."

Another of these insects is known as the Horse-fly; † fastening as it does voraciously, and partially imbedding itself, in the skin of that animal. Dragon-flies are popularly called "horse-stingers;" but this is an error, as these insects have no apparatus for stinging.

THE TSETSE.‡

This insect is the poison-fly of Africa. Possessed of a particular sort of venom, it forces its sting into cattle, which fall dead before it. In vain does the traveller take horses or other animals with him; this scourge destroys them.

Mr. Anderson, a very enterprising traveller, thus writes respecting it:—

"The tsetse is found chiefly in the bush, or amongst the reeds, but rarely in the open country. It is confined to particular spots, and is never known to shift its haunts. Thus, cattle may be seen grazing securely on one side of a river, whilst the opposite bank swarms with the insect. Should the natives, who are well acquainted with localities frequented by the fly, have occasion to change their cattle-posts, and be obliged to pass through tracts of country where it exists, they choose, I am told, a moonlight winter's night; as, during the hours of rest in the cold season, it does not bite.

"In size, the tsetse is somewhat less than the common blue fly that settles on meat; but its wings are longer. Yet, though so small and insignificant in appearance, its bite carries with it a poison equal to that of the most deadly reptile. Many is the traveller who, from his draught-oxen and horses having been destroyed by this pestiferous insect, has not only had the object of his journey completely marred, but his personal safety endangered by the loss of his means of conveyance.

"Very lately, indeed, a party of Griquas, about twenty in number, who were elephant-hunting to the north-west of the Ngami, and who were provided with three wagons and a large number of trek, or draught-oxen, lost, prior to their return to the lake, all their cattle by the bite of the tsetse. Some horses, brought with them to further their sport, shared a similar fate.

"The very same year that this disaster happened to the Griquas, a party of Englishmen, amongst whom was my friend, Mr. Frederick Green, attempted to reach Libèbé; but they had only proceeded

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* Œstridæ.

† Œstrus equus.

‡ Glossina morsitans.

seven or eight days' journey to the north of the Ngami, when both horses and cattle were bitten by the fly in question, and the party were in consequence compelled to make a hasty retreat. One of the number, I am told, was thus deprived of as many as thirty-six horses, excellent hunters, and all sustained heavy losses in cattle.

TSETSE AND PROBOSCIS.

"There are large tribes which cannot keep either cattle or sheep, because the tsetse abounds in their country. But it is only fatal to domestic animals, as wild animals feed undisturbed in parts infested by the insect. Yet many of them, such as oxen and buffaloes, horses and zebras, dogs and jackals, &c., possess somewhat the same nature. Moreover, it bites man and no danger follows. The sensation experienced has not inaptly been likened to the sting of a flea. The problem to be solved is, what quality exists in domestication which renders domestic animals obnoxious to this poison? Is man not as much a domestic animal as a dog? Is it the tsetse at all which kills the animal?

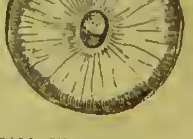
"Captain Vardon, of the Indian army, one of the early pioneers of the more interior parts of Southern Africa, was amongst the first to decide the point; for he rode his horse up a hill infested by tsetse, and in twenty days his doubts were removed by the death of his horse."

GALL-FLIES.*

EACH of the Gall-insects, with some of which we are more familiar, is provided with an auger, nicely adapted to the form of the body, and also to freedom of motion. It is hollowed, and the end has small teeth, like the iron point of an arrow; and with these the insect enlarges the notches it makes in different parts of vegetables, in order to lay its eggs there. The juice of these vegetables expanding through the vessels which are thus opened, form an excrescence, which is called a gall, in which the egg is inclosed, and from which a caterpillar comes. The young insects find in their abode the means of support; they suck and gnaw the interior of the gall, which grows and becomes solid in proportion as it is eaten.

GALL ON A LEAF.

Some of these galls resemble beautiful berries in their appearance; while others look like apples, whence they have derived the name of gall-apples. Others are globular in their form, of a bright red colour, and having a smooth, fleshy consistence, resembling beautiful fruits, they are eaten as such in the Levant. Others again appear like a capsule, and an eminent modern chemist in Aleppo considers them actually to be capsules. Some, says Mr. Kirby, are exactly round; others like little mushrooms; others resemble artichokes; while others, again, might be taken for flowers. In short, they are of a hundred different forms, and of all sizes, from that of a pin's-head to that of a walnut. Nor is their situation on the plant less diversified. Some are found upon the leaf itself; others upon the foot stalks only; others upon the roots, and others upon the buds. Some of them cause the branches upon which they grow to shoot out into such singular forms, that the plants producing them were esteemed by the old botanists distinct species.


GALL CUT OPEN: CATERPILLAR IN CENTRE.

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* Gallinsecta.

The oak-galls are nearly round, and vary in size from a pea to a hazel-nut. They have a bitter and a stringent taste, but no smell, and are chiefly used for the manufacture of ink. Another gall-maker is the cochineal insect.*

OAK-APPLES.

Linnæus placed Spiders and Scorpions among insects; but later naturalists have formed of them a separate class of animals. Let, for example, a *Sirex gigas*, or any other insect already described, be compared with a spider, and a great difference will at once be palpable. They differ, in fact, from insects in having no antennæ; in the eyes being in most species eight, and even when only two in number, never being placed laterally on the head; in the legs being usually eight, though in some species six, and in others ten; and in their respiratory apparatus consisting of radiated tracheæ, communicating with a sort of gills inclosed in pouches on the lower part of the abdomen.

SIREX GIGAS, LINN., MALE AND FEMALE.

The skin or crust of the *Arachnida* is in general more leathery than horny; but whether it be soft, as in most species, or hard, as in a few, it performs a similar office to the bones of larger animals, in giving support to the soft parts and attachments to the muscles, the legs being joined upon and radiating from a common breast-plate externally; while, according to Straus-Dürckheim, there is also an internal breast-plate of a gristly texture, in form of a horse-shoe, the two ends of which are directed forwards.

SPIDERS.†

THESE creatures, on being liberated from the egg, are perfectly formed, though very minute, and they do not, like insects, undergo transformations. Many of them breathe through lungs, and hence their respiratory apparatus forms another ground of distinction. They are all predacious, and live on small insects which they are able to overcome.

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* See page 215

† Araneidæ.

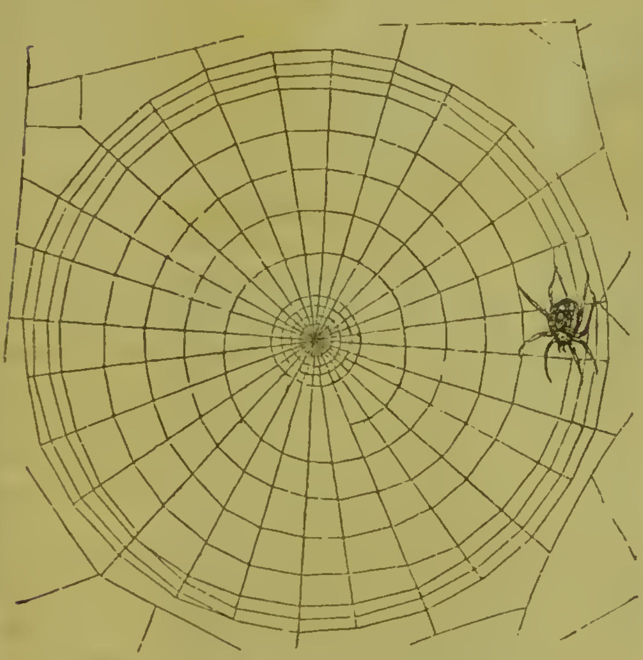
Some spin the webs which are the abhorrence of all tidy housekeepers, though it is deeply interesting to mark the progress of the structure.

THE GEOMETRIC, OR GARDEN SPIDER.

THE Geometric Spider of our gardens* is as remarkable for the beauty of its marking as it is for the lightness and filmy delicacy of the webs it constructs. Who that has walked abroad on a fine autumnal morning, with his senses alive to Nature's thousand charms, can have failed to notice the threads and circular net of this artist, laden with pearly drops of dew, hanging in profusion along every hedgerow and on every bush, and noticing, can have failed to reflect on Him who has taught

> "The wild bird how to build its nest,
> The insect weave its web?"

FOOT OF A SPIDER, MAGNIFIED.



THE SPIDER CONSTRUCTING HIS WEB.

The mode in which the geometric spider constructs its net is very curious; and some points connected with the subject are not yet quite understood. Its first object is to construct the outline, which it does by passing from one leaf or sprig to another, fixing its threads as it proceeds, and thus encircling a considerable area. This outline it strengthens by fresh additions, until a due degree of toughness is produced, keeping the whole in the requisite degree of tension, by securing the line to every possible object.

The outline thus formed, the next step is to fill it up by radii, like the spokes of a wheel. To do this, the spider fixes a thread to a convenient part of the outline, which she traverses until she reaches the opposite spot to that where she fixed her thread. All this time she was drawing out her line, keeping it distinct by one of her hind feet, so as to prevent it being glued to the threads along which she walked: this thread she now fixes; it crosses the middle of the area. She now alters her plan, and begins at the middle of this diagonal thread, where she fastens another, carrying it to the nearest part of the outline, to be there secured. From the same spot, which is to be the centre of the net, she again carries another thread to the outline, and so on until the number of radii are completed, generally from twenty to thirty. Having assured herself that each thread is sufficiently strong, which she does by pulling at each separately, and replacing such as may be found faulty, the spider next proceeds to form the concentric circles. Beginning at the centre, she spins a ring, attached to each radius at a little distance from the centre point; this is followed by others at a very small interval from each other: the interval, however, increasing as she proceeds from the centre to the circumference. The whole of these circles being finished, she now returns to the centre, and bites off the point at which all the radii were united, so as to make their security depend on the circular threads alone; by this mode the elasticity of the net is most probably increased. In this central spot the spider takes her station, on the watch for prey. This is, however, by no means an invariable rule; for she always spins a cell in some retired spot, in which to lurk unobserved, having threads of communication from her retreat to the centre of the net, the vibrations of which serve to inform her of the capture of her booty.

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* Epeira diadema.

So far all is tolerably plain; but we have yet to account for those long lines, stretched to distant points, which it was impossible for the spider to have personally visited. These lines sometimes pass from the web to distant branches; sometimes from one branch to another; we have seen them yards in length, passing from a hedge-row to trees at a considerable distance, and at various degrees of elevation from the ground.

The explanation of the fact is thus given by Mr. Blackwall, who says: "I have thoroughly satisfied myself, by observation and experiment, that in such instances spiders invariably avail themselves of currents of air, by which their lines are sometimes carried to a surprising distance. If the geometric spider be placed on twigs, set upright in glazed earthen vessels, with perpendicular sides, containing a quantity of water sufficient to immerse their bases, the spiders thus insulated use every means in their power to effect an escape; all their efforts, however, uniformly prove unavailing in a still atmosphere; nevertheless, when exposed to a current of air, or when gently blown upon with the breath, they immediately turn the abdomen in the direction of the breeze, and emit from the spinning apparatus some of their liquid gum, which being carried out in a line by the current, becomes connected with some object in the vicinity. This the spider ascertains by pulling at it with her feet, and drawing it in till it is sufficiently tense; she gums it fast to the twig, and passing along it speedily regains her liberty. Now, that the same means are frequently resorted to by spiders in their natural haunts, for the purposes of changing their situation and fixing the foundations of their snares, I have repeatedly observed."

GEOMETRIC, OR GARDEN SPIDER.

It must not be forgotten, however, that this theory of Mr. Blackwall is by no means confirmed. On this subject we refer to a most interesting paper on the aërial spider, by J. Murray, Esq., in the first volume of "Loudon's Magazine of Natural History." This talented writer observes that "the aëronautic spider can propel its threads, both horizontally and vertically, and at all relative angles, in motionless air, or in an atmosphere agitated by winds; nay, more, the aërial traveller can even dart its thread, to use a nautical phrase, in the 'wind's eye.' My opinion and observations are based on hundreds of experiments; on favourable occasions I am constantly extending their amount, and as often do I find my deductions supported—namely, that the entire phenomena are electrical."

Slight and even simple as the threads of the spider may appear, they are not so in reality; and this forms one of the many examples in which the eye of the naturalist discovers some concealed elegance or complex mechanism, which, though daily visible, is concealed from those

> "Who walk through Nature with their half-shut eyes."

It has been incontestably shown that a spider's thread, even spun by the smallest species, and when so fine that it is almost imperceptible to our senses, is not, as we suppose, a single line. A spider has a spinneret, showing several little projections, each of which contains a great many tubes, so that a space often no larger than the pointed end of a pin has one thousand of them. From each of these tubes, consisting of two pieces, the last of which has an exceedingly fine point, an amazingly slender thread proceeds, which immediately after unites with all the other threads, so that one only may be formed. Thus, from each spinner there issues a compound thread, and these fine threads, at about a tenth of an

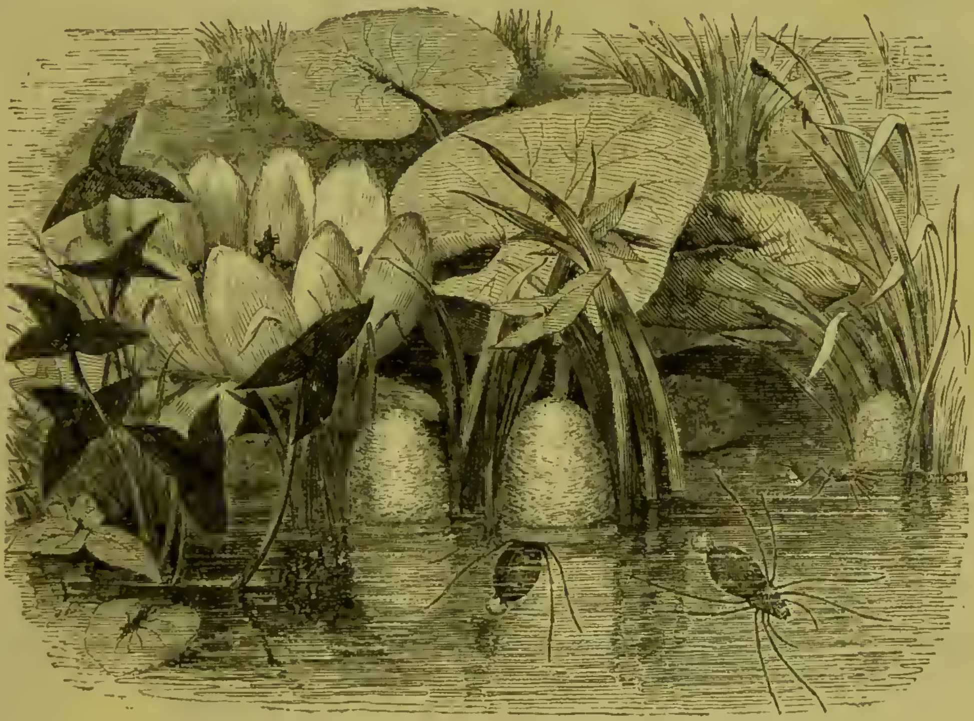
SPINNERET OF HOUSE-SPIDER.

inch from the point of the spinners, again unite, and form the cordage of the spider's web, each of which is composed of five thousand fibres.

THE WATER-SPIDER.

LOOKING into a large glass globe, filled with water, in which are immerged several portions of aquatic vegetables, some floating on the surface and some lying at the bottom, there may sometimes be seen amongst the blades of grass and bits of reed, a sort of purse, closely resembling in shape and size a pigeon's egg, but pierced transversely through the middle. It is filled with air, and perfectly closed, except in its lower part, where there is an aperture just sufficient for the ingress and egress of a very small spider. A strong and semi-transparent substance, resembling white gauze, forms the texture of the bell, firmly moored and anchored to the submerged plants by threads and cables, which hinder it from mounting to the surface.

M. Berthoud, a French naturalist, discovered them in the ponds of Gentilly, where they exist in great numbers; but their habits had long been known. He, however, examined them minutely, and we shall be guided in our account by his observations.



WATER SPIDER.

Watch the lady of the mansion coming out of her retreat. Her length is about one-eighth of an inch, her body is brown, and upon the upper part of the back is drawn a dark patch, having four little dots on its centre, This spider lives under water, and yet requires air to breathe. Her Maker has taught her how to solve a problem which would have baffled the genius of Newton.

She swims on her back, and her abdomen is enveloped in a bubble of air, which, reflecting the prismatic colours, looks like transparent mother-o'-pearl. She then rises to the surface of the water, and elevates above it the lower portion of her body; for amongst the *Arachnidæ* the orifice of the organs of respiration is placed in the abdomen. Once on the surface, she breathes strongly, inhales as much air as she possibly can; then she gets beneath the water, and gives out gently the liquid particles with which her lungs are gorged to excess. The long, silky, clammy threads which cover her retain in its place around her the bubble with which she is surrounded. This done, she dives with precaution, and carries into her nest a provision of air, to replace what she had consumed.

When once ensconced in her nest, she lies in ambush, with her cunning little head lowered, watching for any prey that may chance to pass. Woe to the tiny worm that wriggles on the stalk near her den! She darts forward, seizes him, and bears him off to her bed of impermeable gauze. Curious, indeed, is that little dwelling. While it was in process of making, it was naturally filled with water; but when once the work was ended, it became necessary to expel the water, and replace it by atmospheric air. To attain this end the spider had to make more than a hundred trips to the surface. Each bubble that she introduced mounted towards the top by its specific levity, displacing an equal quantity of water, which was forced out through the orifice below, until the bell contained nothing but air.

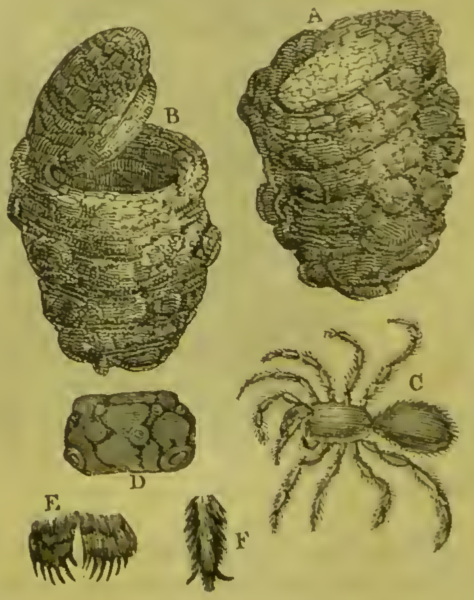
WATER-SPIDER, ENLARGED TWO-THIRDS.

The eggs are enveloped in a cocoon of silk; they are of a yellow orange colour, and may be easily perceived through the white transparent nest. In a short time the young begin to build for themselves, and may be seen swimming in the still water.

The water-spider every year rebuilds its nest very near the spot it has formerly occupied. It searches the water with astonishing precision, and is watchful over those water-plants in which are found the small aquatic insects which serve as its food. But how these little creatures can envelope the abdomen with an air-bubble, and retain it till they enter their cells, is still a mystery which remains to be explained.

THE MASON SPIDER.*

Numerous and various are the Mason Spiders; but the one of which we give engravings is found in the south of France. She usually selects for her nest a place bare of grass, sloping in such a manner as to carry off the water, and of a firm soil, without rocks or small stones. She digs a nest a foot or two in depth, and of a diameter equal throughout, sufficient to admit of her easily passing. She lines this with a tapestry of silk, glued to the walls. The door, which is circular, is constructed of many layers of earth kneaded and bound together with silk. Externally, it is flat and rough, corresponding to the earth around the entrance, for the purpose, no doubt, of concealment; on the inside it is convex, and tapestried thickly with a web of fine silk. The threads of this door-tapestry are prolonged, and strongly attached to the upper side of the entrance, forming an excellent hinge, which, when pushed open by the spider, shuts again by its own weight, without the aid of spring hinges. When the spider is at home, and her door forcibly opened, she pulls it strongly inwards, and even when half opened often snatches it out of the hand; but, when she is foiled in this, she retreats to the bottom of her nest, as the last resource.



A, THE NEST SHUT. B, THE NEST OPEN. C, THE SPIDER (*Mygale cæmentaria*). D, THE EYES MAGNIFIED. E, F, PARTS OF THE FOOT AND CLAW MAGNIFIED.

THE MYGALE.†

Another spider may be seen in Ceylon, of so great a size as nearly to cover with its legs an ordinary sized breakfast plate. Though it does not weave a broad web, like other spiders, it forms a comfortable mansion in the wall of a neglected building, the hollow of a tree, or the eaves of an overhanging stone. This it lines throughout with a tapestry of silk, of a tubular form, and a texture so exquisitely fine and closely woven that no moisture can penetrate it. The extremity of the tube is carried out to the entrance, where it expands into a little platform, stayed by braces to the nearest objects that afford a firm hold. In particular situations, where the entrance is exposed to the wind, the mygale, on the approach of the monsoon, extends the strong tissue above it, to serve as an awning to prevent the access of rain. And yet this skilfully-constructed silken dwelling serves no purpose in trapping or securing prey; no external disturbance of it tempts the creature to sally out and surprise the intruder; it is exclusively designed for the domestic luxury of the spider.

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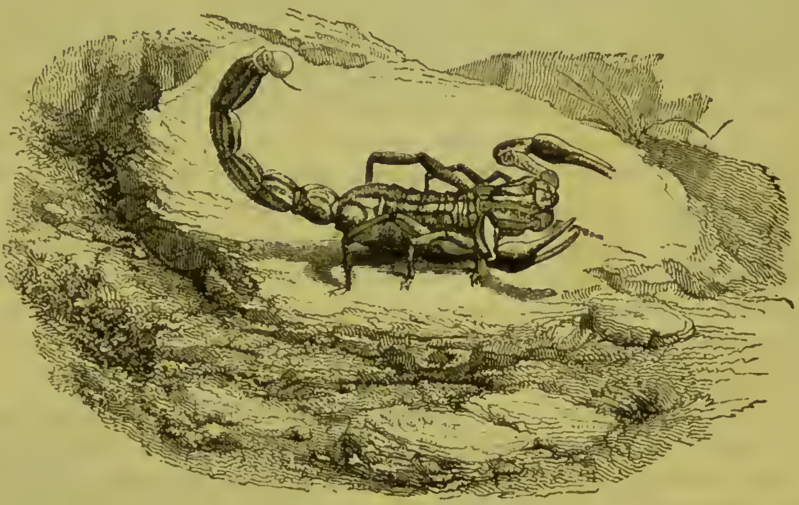
* Mygale cæmentaria.

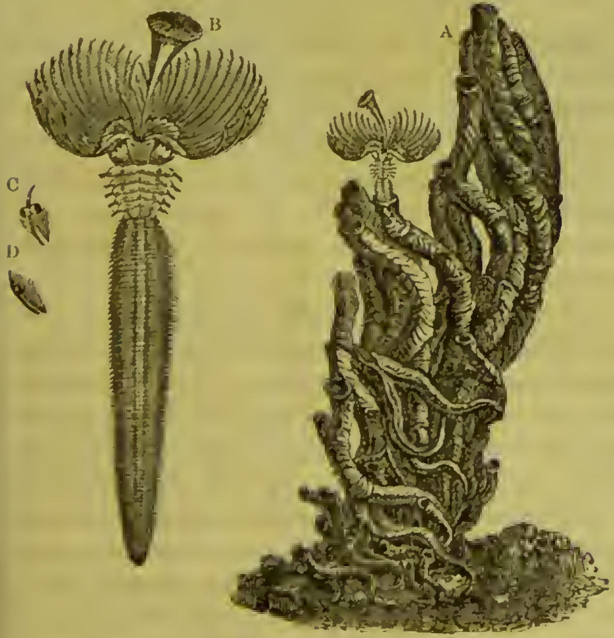
† Mygale fasciata.

The animals of another family* of this class are commonly called Scorpions. They are distinguished from other groups by having the abdomen articulated, and terminated by a curved spur at the extremity; the palpi are very large, and the terminal segment assumes the form of the lobster's claw, being in like manner provided with pincers; the stigmata are eight in number, and situated along the inferior and lateral part of the abdomen; on the under side of the thorax are two comb-like appendages. The number of the eyes varies from eight to twelve in different species.


THE SCORPION.

The scorpions inhabit the hot countries of both hemispheres, live on the ground, conceal themselves under stones and other bodies, most commonly in ruins, dark and cool places, and even in houses. With their forceps they seize various insects, on which they feed after having pierced them with their sting.

The name of another extensive division or class † of animals established by modern naturalists, is derived from the Latin word *annulus*, a ring, because the body is always formed of a great number of rings. Their outer covering is soft and pliable; and their bodies, having no bony skeleton, are soft, and in general more or less of a cylindrical form.



VERMICULAR SERPULA.
A, the serpula in its tube. B, the serpula out of its tube. C, D, extremities of a gill.

In this class are found some very remarkable creatures, with which, however, an acquaintance may easily be made. The under sides of every ledge, of every boulder, and of almost every pebble are studded with the twisting, creeping tubes of the Serpula; fine specimens of which are about one-fourth of an inch in diameter, each one being, like the shell of the oyster, the work of the little indweller. Watch the first of these which you can observe in a vivarium. The tube perhaps is closed, but now first comes forth its curious vermilion stopper, which has formed a beautiful and perfect defence; and then the breathing organs, an exquisite structure, adorned, it may be, with the richest tints of yellow, violet, azure, or crimson. That inverted cone-like body will be thrown off after a few weeks' service, only to be succeeded, however, by another, another, and another.

You wish, it may be, to examine the serpula more narrowly, and so, with a lens to your eye, you make an approach to the glass of the tank in which one has been placed. But, with the rapidity of a flash of lightning, he has withdrawn into his tube, as if conscious of danger; and only when he feels perfectly safe will he again be visible. Mr. Gosse has more minutely and happily described than any one else the wondrous mechanism of these two actions; and of this a succinct account may now be given. Behind the head, or what may be so termed, the sides of the body are cut into nipple-like feet, about seven pairs in all; these are perforated, and carry so many bundles of fine, elastic, horny bristles, like the hairs of a camel's-hair pencil, each pencil carrying from twenty to thirty bristles. A few of these are simple hairs, but the majority are of elaborate workmanship; for each one consists of a transparent, yellow, horny shaft, the extremity of which expands into a slightly enlarged knob. This knob is cleft into four points, three of which are minute, but the fourth is developed into a long, highly-elastic, and finely-pointed spear; and the pencils are acted on by appropriate muscles.

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* Scorpionidæ.

† Annelida.

When the serpula would extrude its body from the tube, these organs push against the walls of the interior, which are lined, as you may see, with a delicate membrane. The opposite feet of one segment protrude the pencils of bristles, one on each side, the acute points of which penetrate and catch in the lining membrane; the segments behind this are now drawn up close, and extend their bristles: these catch in like manner; then an elongating movement takes place; the pencils of the anterior segments being now retracted, they yield to the movement, and are pushed forward, while the others are held firm by the resistance of their holding bristles; thus gradually the fore parts of the animal are exposed.

But this gradual process would not meet the need of a creature so sensitive to alarm when it wishes to retreat; a further provision is therefore necessary, and this Mr. Gosse has clearly and ably described. "If," he says, "we look at a serpula recently dead—which we may readily do, since it is the habit of most of these creatures to come out to die—we shall find, with a lens, a pale yellow line running along the upper surface of each part, transversely to the length of the body. This yellow line, which cannot be appreciated by the unassisted eye, is a muscular ribbon, on which stands up edge-wise a multitude of what I will call combs, or rather sub-triangular plates. The edge of each plate is cut very regularly into six teeth, which curve in one direction, and one other curved so as to face these. The combs stand side by side, parallel to each other, along the whole length of the ribbon, and there are muscular fibres seen affixed to the smaller end of every plate, which doubtless give it independent motion. I counted 136 plates on one ribbon; there are two ribbons on each thoracic segment, and there are seven such segments; hence we may compute the number of comb-like plates to be about 1,900, each of which is wielded by muscles at the will of the animal; while, as each plate carries seven teeth, there are between 13,000 and 14,000 teeth hooked into the lining membrane of the cell, when the animal chooses to descend." No wonder that, provided with so complicated and perfect an apparatus, he retreats so rapidly.

EARTH-WORMS.

Another creature, the Terebella, forms a tube of bits of "beach," arranging them as regularly as rows of bricks, and strongly cementing them together. If one be placed in a vessel of water, and supplied with the requisite materials, it may be seen pursuing its task. Moving its head continually from side to side, it lengthens or shortens the thread-like rays that are placed there, and with a glutinous membrane for the base of its tube, piles on it piece after piece, which adhere immediately to it. In summer it will build a new house in about four hours; in winter an hour or two longer is required.

A friend of the writer's had one of these creatures in an aquarium, and wishing to help it in its structure, placed at its disposal some blue glass beads. These, however, it treated with neglect; but on their being broken small, it employed them in rearing its house.

THE EARTH WORM.*

THIS animal presents externally a body composed of numerous narrow rings closely approximated to each other. In the night season, and at early morning, hundreds may be seen, though not one, unless they are disturbed either by moving the ground or pouring liquids into their holes, is to be found moving about in the day.

The worm-casts which so annoy the gardener by deforming his smooth-shaven lawns, are of no small importance to the agriculturist; and this despised creature is not only of great service in loosening the earth and rendering it permeable by air and water, but is also a most active and powerful agent in adding to the depth of the soil, and in covering comparatively barren tracts with a superficial layer of vegetable mould.

THE LEECH.†

THE outer investment of this creature may be described as a muscular tunic, with a coloured pigment on its surface, the whole being covered with a delicately thin cuticular membrane, lubricated with a mucous fluid.

THE MEDICINAL LEECH.

At its caudal extremity its fibres enter into the structure of a sucking disc, and some there assume a radiating, others a circular course. The same observation applies to their arrangement on the expansive, movable lips which encircle the oral aperture, and which also form another sucking disc, capable of being attached to objects over which the leech is proceeding.

The caudal and the oral suckers are the principal agents of locomotion on solid surfaces. The caudal sucker, for example, being fixed, the animal elongates its body to the utmost, and there fixes its oral sucker; this done, the caudal sucker is disengaged, the body drawn up, and the sucker fixed again, while the oral sucker is disengaged, the body again elongated, and this sucker once more attached, and so on alternately. By this simple process the leech can crawl along with considerable expedition, and even move up the smooth sides of a glass vessel, or it can there fix itself and rest.

Destined to prey on the blood of animals, the mouth or disc-like lips may be compared to a cupping-glass; but it is one containing lancets for making, when fixed on the skin, three superficial yet sufficient incisions. Around it are arranged three minute cartilaginous teeth, so situated as to form the three points of a triangle. Each tooth has a free edge, resembling that of a semicircular saw. Hence, when the oral disc is fixed upon the skin, the edges of these little saws are brought in contact with it, and so worked by the muscular fibres in the midst of which they are implanted, as to divide the skin and capillary vessels, from which the blood is sucked by means of a strong and very apparent muscular action, so as gradually to fill the stomach and its appendages.

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* Lumbricus terrestris.

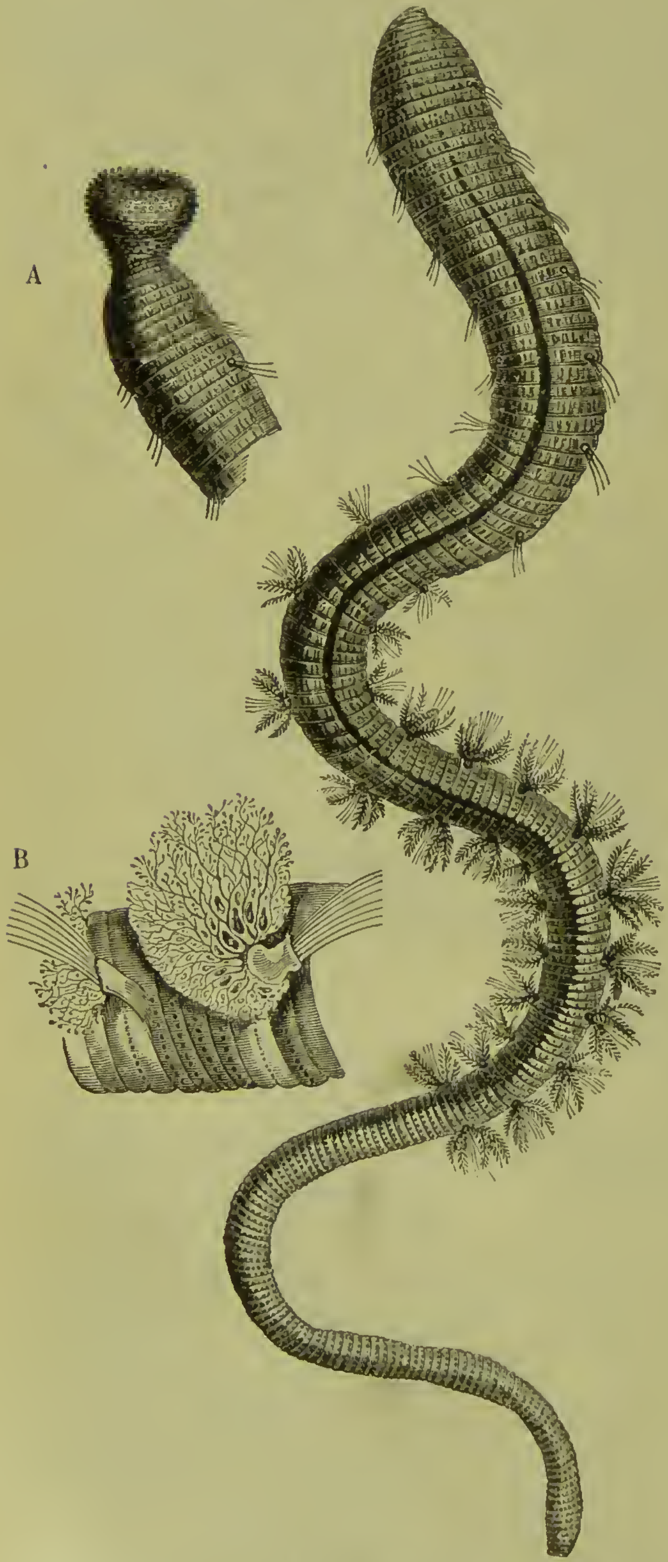
† Hirudo medicinalis.

One genus[*] is remarkable for the animals included in it having external gills. The gills are branched and placed upon the rings of the middle part of the body only. The mouth is fleshy, more or less dilatable, but there are no discernible teeth, tentacles, or eyes. The posterior extremity of the body has not only no gills, but is devoid of the silky bristles which are found on every other part.

Another order of animals[†] is named from the attachment of the respiratory organs to the dorsal surface of the body, along the whole or the greater portion of its length. All the species belonging to it are aquatic and worm-like. They are active in their crawling, and swim with facility. Their head is distinct from their trunk. They are furnished with two pairs of rudimentary eyes. The mouth is fleshy, and more or less dilatable, but there are no discernible teeth or tentacles. The posterior extremity of the body has not only no gills, but is devoid of the silky bristles which are found on every other part. A diversity, however, appears in the several species.

THE EUNICE.

THIS animal is furnished with tuft-like gills; the trunk is armed with three pairs of horny jaws; each of the feet has two cirrhi and a bundle of bristles; two tentacles upon the head above the mouth, and two on the neck. One of these creatures[‡] is the largest annelide known. It attains a length of from one to four feet, and inhabits the sea round the Antilles. The difference between the form of the Eunice and the Cirratule, also made known to us by Lamarck, will be apparent on a reference to the engraving. The respiratory organs of this group, often resembling



THE LUG WORM.

A, anterior extremity of the body, showing the trunk. B, one of the rings of the body removed from the side, to show the breathing vessels.

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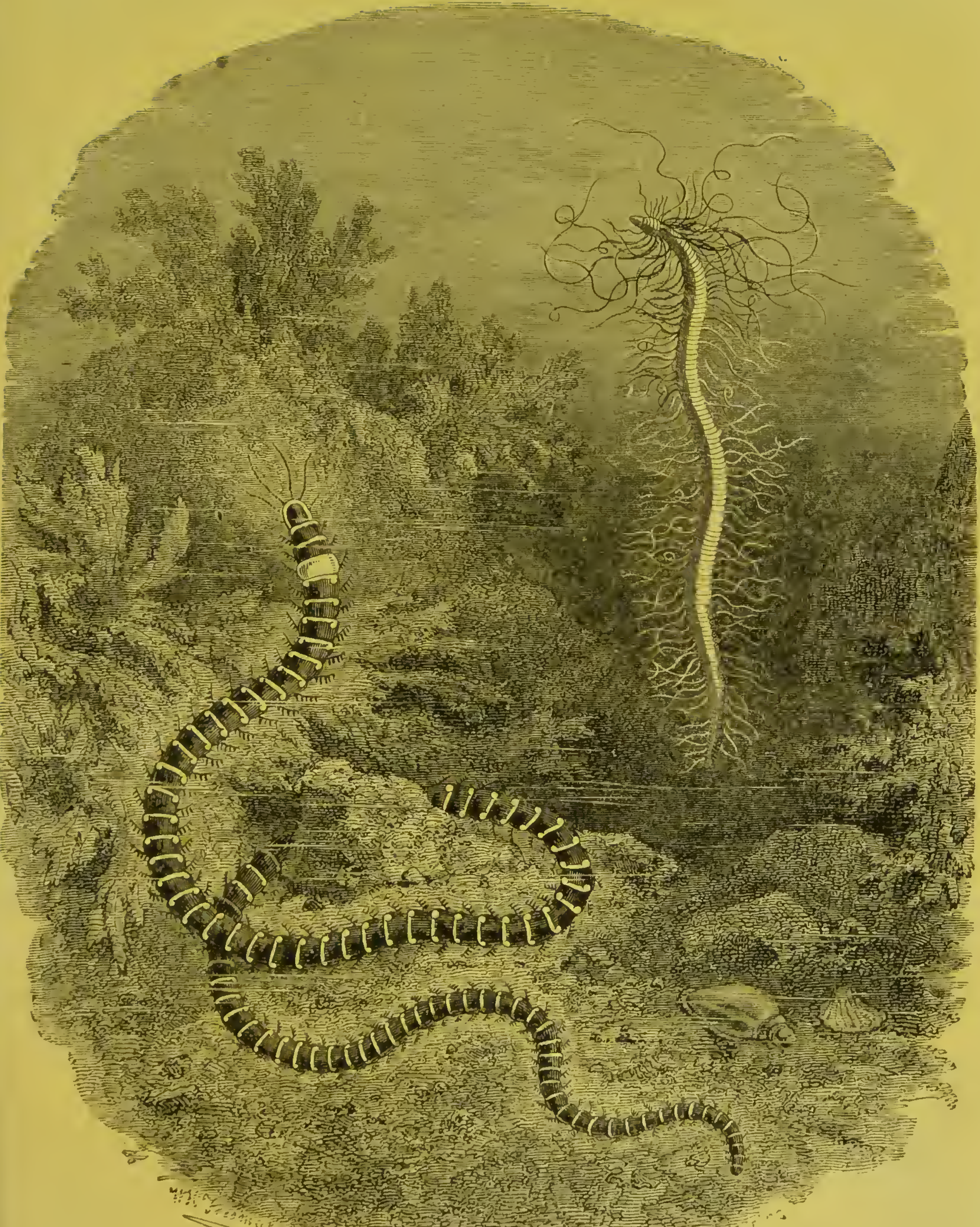
[*] Arenicola.

[†] Dorsibranchiatæ.

[‡] Eunice gigantea.



EUNICE AND CIRRATULÉ. LAMARCK.

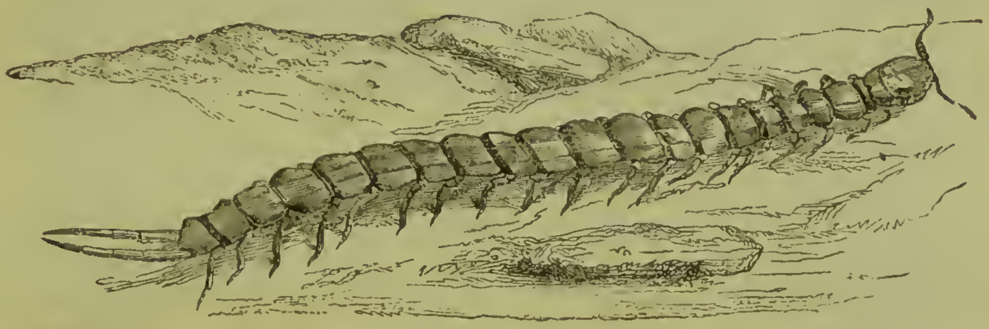
beautiful feathery tufts, are attached in pairs either to every segment of the body, or to a certain number of the middle segments. These organs sometimes display the most elegant variations of form and the richest colours.

THE LUG WORM.*

This common species is found abundantly in the sand of the sea-shore, where its habits afford a close resemblance to those of the earth worm away from the shore. It is bigger than the earth worm, sometimes being found nearly a foot in length. It is of a reddish colour, and when touched throws out a quantity of a yellow fluid which stains the hand. It is employed by fishermen as bait for various kinds of sea-fish.

ARTICULATE ANIMALS.

Another class † must now be slightly noticed. The animals forming it agree with the Annelides in the longitudinal extension of their trunk, in the similarity of the segments from one end of the body to the other, and in their cylindrical form. On the other hand, they possess more complete eyes than any of the vermiform tribes, and their respiratory apparatus and the parts of their organisation are more nearly allied to insects. Their covering is firm, and of a horny character. Of these the Centipede will serve as an example.



THE CENTIPEDE.‡

The division into segments of many of these creatures is very distinct, a flexible membrane being interposed between each pair of firm rings or plates. The legs and other appendages are inclosed in the same kind of integument, and their joints are formed in the same manner as those of the body. The number of segments is considerable, and most of them bear two pairs of thread-like legs, so that the number of these members sometimes amounts to 160 pairs.

The animal seems rather to glide or crawl, like a serpent or worm, with the assistance of the legs, than to use them as its proper instruments of locomotion. This kind of movement is facilitated, in some species, by the incomplete inclosure of the body in the consolidated integument, for this merely forms plates above and below, which are connected at the sides by soft membrane; so that the trunk may be easily placed in any direction. When at rest the body is rolled up in a spiral form; so that the legs, concealed in the cavity of the spine, are protected from injury.

In the higher division, on the other hand—of which the centipede may be taken as the type—the body is flattened, and each segment is inclosed in its horny envelope; the number of segments never exceeds twenty-two, and is sometimes as low as twelve; each segment bearing a single pair of well-developed legs, on which these animals can run with considerable rapidity. Still their bodies are flexible, and they can thus wind their way with facility through very narrow and tortuous passages in search of food.

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* Arenicola piscatorum.

† Articulata

‡ Scolopendra.

CRUSTACEANS, &c.

One class[*] of the general order *Crustacea* includes a number of very diversified animals, of which we can give only as specimens the Wood-Louse and the Whale-Louse.

Another family[†] belongs to a special division of the *Crustacea*;[‡] it is also greatly diversified, and contains a creature as familiar as the Shrimp; of which, however, there are several species.[§]

THE COMMON SHRIMP.[||]

"Walking," says Paley, "by the sea-side, in a calm evening, upon a sandy shore, and with an ebbing tide, I have frequently remarked the appearance of a dark cloud, or rather very thick mist, hanging over the edge of the water, to the height, perhaps, of half a yard, and of the breadth of two or three yards, stretching along the coast as far as the eye could reach, and always retiring with the water. When this cloud came to be examined, it proved to be nothing else than so much space filled with young shrimps, in the act of bounding into the air from the shallow margin of the water, or from the wet sand. If any motion of a mute animal could express delight, it was this: if they had meant to make signs of their happiness, they could not have done it more intelligibly. Suppose then—what I have no doubt of—each individual of this number to be in a state of positive enjoyment; what a sum, collectively, of gratification and pleasure have we here before our view!"

The outer covering of the Shrimp consists of a thin shell of a green and transparent colour, spotted with grey. It is divided between the head and tail into six parts, each of which works into the other like the portions of a coat of mail, thus combining hardness with flexibility, while the body is defended without impeding its motions. The tail, consisting of a wing-like apparatus of four parts, which can be folded compactly or extended at pleasure, is admirably adapted to propel the shrimp. The head is provided with a pair of feelers as long as the body, and the two fore-legs are made to act as a hand, being provided with a jointed forceps for the seizure of food. Three pairs of legs are placed on the fore part of the body, and behind are five other pairs of legs, which are much shorter, diminish successively in size, and are fringed with bristles. The fore part of the head has on each side a fan-like wing, feathered on each side, transparent, and so flexible as greatly to aid the motions of the animal.

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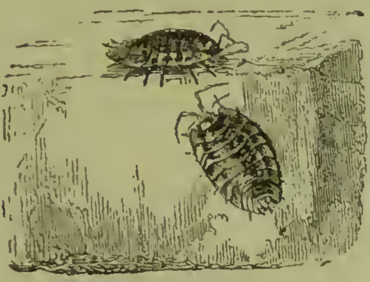
[*] Isopoda.

[†] Crangonidæ.

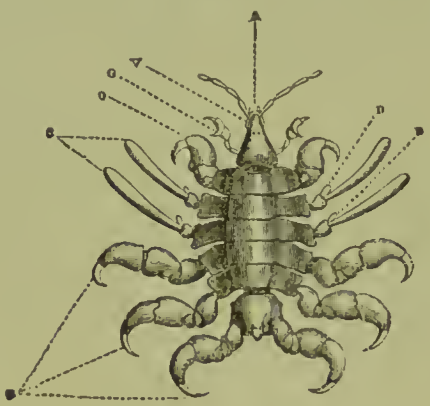
[‡] Decapoda macroura.

[§] C. fasciatus. C. spinosus. C. sculptus. C. trispinosus.

[||] Crangon vulgaris.



COMMON WOOD-LOUSE (*Oniscus asellus*).



THE WHALE-LOUSE (*Oniscus ceti*).

A, the mouth. V, the eyes. O O, first pair of feet, the anterior of which is fixed below and behind the head. B, third, fourth, and fifth pair of claws. C, appendages of second and third segments, having at their base the orifice of the respiratory organs, D D.

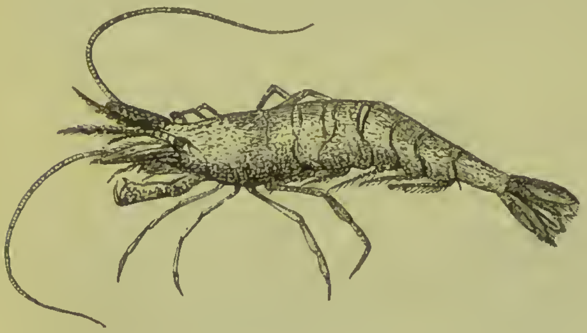
SHRIMPERS.

Shrimps, as may often be observed, are taken for food with a net ; it is used either by a man, woman, or child wading up to the knees, or by fishermen who go out in boats. The boat fishermen often boil them on board. They are not allowed to boil longer, nor generally so long as ten minutes, as they become hard if allowed to remain a longer time, and the fineness of the flavour is also greatly diminished. Their colour is changed by boiling to that which they wear when piled on the dishes of the fishmonger's stall.

Who that has been there does not remember it, for though the road in summer is dusty, it is not long, which conducts the pedestrian from Ramsgate to Pegwell Bay, picturesque as the village is, standing on the edge of the rock, and sketched from all points by artists of high and low degree? Here are places of refreshment and tea-gardens, visited during the season by picnic and other parties, who regard the shrimps as famous both for size and flavour, and who often bear them away potted, to regale their palates when once more at home. Those brought from Leigh and Lynn are also in high repute; but we never had finer or more splendid prawns, with crabs and lobsters to match, than in the Isle of Portland. A gentleman at Brighton, some years ago, observing boiled shrimps everywhere, but unboiled nowhere, suggested to a dealer that they had been probably found alive there and then boiled, when he was surprised by the reply: "They were never alive here; they came, as you see them, from London." Many eat shrimps at the sea-side, who would not touch them if found on their tables in the metropolis or its environs. They are generally consumed by the least wealthy part of the population, as pleasant accompaniments of breakfast and tea; while in the ranks above them a much smaller quantity is consumed in sauces and in a potted state.

THE PRAWN.*

The Common Prawn is an interesting and beautiful creature. The first pair of feet are slender and most delicate in their structure, and provided with a brush-like appendage of short hairs. Wonderful is their power of motion, and still more so the purposes for which they are used. They are placed around the eyes, as we have often observed, and about the jaws, horns, and feelers, and the other beautifully constructed and arranged parts of the body, to clean them thoroughly; the body being supported and raised high on the four pair of legs, and the lower part of the tail being curved forward between them, expressly for this purpose. The appearance of the prawn in full swimming action is very elegant. The body is transparent, and the front feet are generally laid backward and tucked under the body, like the fore-legs of a stag in the act of leaping; the long antennæ float gracefully on each side of the body, while its strong paddles urge it rapidly through the water. It has also prominent and stalked eyes.


THE SHRIMP.

THE PRAWN.

The prawn not only forages for food by swimming about in the waters, but it thrusts its second pair of feet very cautiously into every cranny in its way, into the tubes of the marine worms, or the single shells of molluscs, and were it not for the lids with which they are provided, the little in-dwellers would soon be a prey. Only let anything edible be met with, and these hand-like feet seize it and transfer it to the jaws. The antennæ, or horns, appear to be organs of smell as well as touch. Thus, when a particle of food has been dropped into a vessel containing some of these creatures, and has sunk to the bottom, the moment the antennæ of a prawn has passed across the column of water through which the food has fallen, the creature changes its motion, and darts rapidly here and there, from the surface throughout the path of its transit, till it is discovered. Often after its being actually devoured, another prawn will gain the scent, which seems to remain, and engage most zealously in searching for a prey. A prawn has even tracked the same food to an anemone, and dragged it not merely from the pouch, but from the stomach of the animal; which can only be secured by bringing all its tentacles together, forming itself into a small globe, and closing all approach to the entrance of its body.

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* Astacus serratus.

Like its fellows, the shrimp, the crab, and the lobster, the prawn changes its skin. When the time comes for this process, it ceases to feed, and moves about very restless, till it has fixed on some spot it prefers. The third, fourth, and fifth pairs of legs are then stretched out wide apart, and the feet hooked so as to hold firmly upon the surrounding substances, in such a way that the body may be poised and capable of moving freely in all directions. The prawn then slowly sways itself to and fro, and from side to side, with strong muscular efforts, apparently for the purpose of loosening the whole surface of the body from the body-shell. The two pairs of seizing-legs are at the same time kept raised from the ground, stretched forwards, and frequently rubbed over each other; the eyes also move within their covering by contraction from side to side; and when every precaution appears to have been taken, a fissure takes place between the body-shell and the abdomen at the upper and back part, and the head, antennæ, legs, and feet, with all their delicate appendages, are slowly and carefully drawn backward and out from the shield, until even the eyes are quite clear of the body-shell, and appear above the margin of it; the prawn, thus half released, then makes a sudden backward spring or jerk, and the whole covering is left behind, generally adhering by the shell of the six feet to the surface it had selected for its purpose.

Mr. R. Warrington, to whom we are indebted for the materials of this description, well remarks :—"A moment's consideration will develop to the contemplative mind what a truly wondrous process this act of exuviation really is. When we reflect on the small size of this crustacean, and the extreme delicacy and intricacy of its various organs, and then find that in this moulting the skin of the most minute and complicated of these structures is thrown off in a complete and unruptured state—even to the gauze-like membrane covering the projecting and pedicled eye, the filamentous antennæ, the many-jointed legs, the delicate hand, the paddled abdomen, with its beautiful appendages, the palpi, and all the minute spines and microscopic hairs with which all these various members are provided—the human mind can hardly appreciate the wonderful wisdom of the creative power that could have called into existence so marvellous an adaptation."

THE PRAWN NET.

A few facts may yet be added. No sooner has the prawn been liberated from its old covering, than it rolls on the surface of the ground perfectly helpless, for so soft is it that it has not the power of supporting its own weight erect upon its feet, while the delicate antennæ float on the water like gossamer threads. Soon, however, it plunges or springs, by a strong muscular exertion of the abdomen, from place to place, stretches its webbed tail and the large paddles of its swimming apparatus, and speedily retreats into some dark or sheltered corner, where it remains, continually exercising its various organs, until its new covering is sufficiently hard to allow of its venturing forth among its companions, which, as yet, it has been obliged to avoid by a series of forcible leaps. In due time, it comes forth from its hiding-place with greatly increased beauty; its colours, particularly the orange and rich brown bands which encircle the pale blue feet, are remarkably bright and clean; the markings are nicely defined, and the small spines and fringes of hair are admirably developed and clear. The creature seems, indeed, proud of its new vesture, and may well call forth expressions of delight.

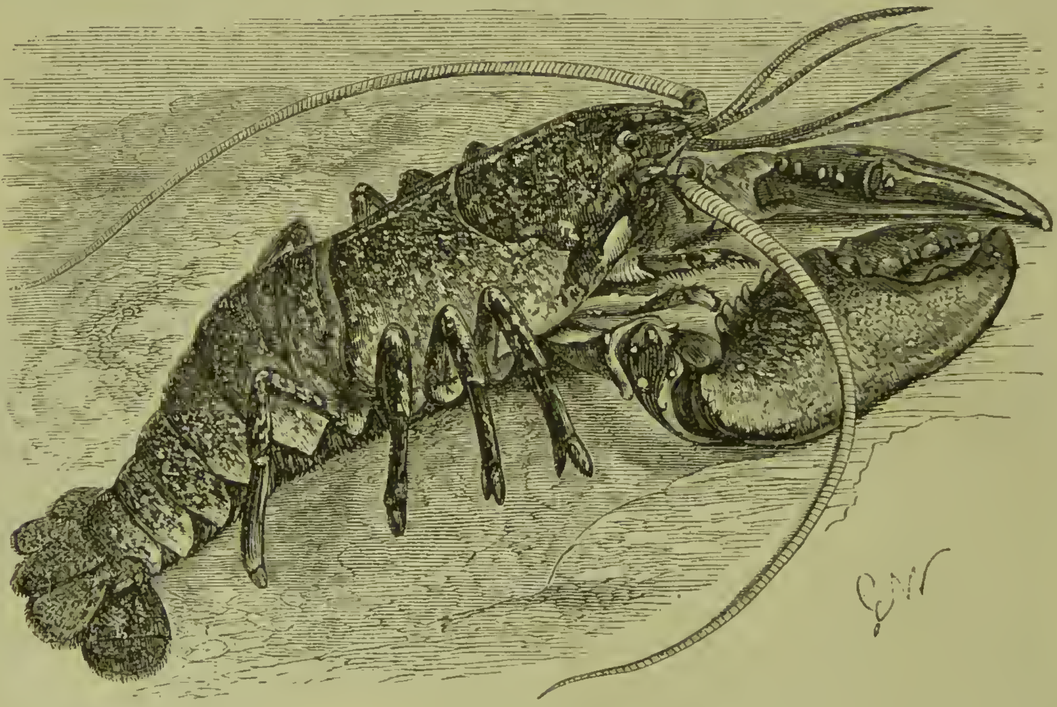
THE LOBSTER.*

With this example of a genus of Crustaceans†, remarkable for their long tails, all are familiar. It is found in the greatest abundance on the rocky coasts of this kingdom, in clear water of no very great depth, at the time of depositing its eggs, about the middle of summer.

The head and thorax of this creature are blended, as in the scorpion, into one portion, termed the *cephalo-thorax*, which is covered by a dorsal shield or carapace above, and below by a narrow plastron, to the sides of which the legs are attached. To this succeeds the abdominal portion, often called the tail, defended above by seven broad, arched plates of armour, hinged upon each other, and regularly overlapping each other in succession. Of these, the last may be regarded as caudal, with two oar-like plates on each side, of which the outermost is transversely jointed.

The limbs are divided into three sets. On each side of the mouth are five limbs, termed foot-jaws, furnished with tentacular appendages. These limbs manipulate the food, turn it about, and apply it to the powerful jaws.

Next succeed five pairs of true limbs. Of these, the first pair are remarkably developed, possessing great power; and the last joint consists of large pincers, acted upon by voluminous muscles, and capable of inflicting severe injury. The two pairs of pincers differ in form and use. The left hand pair have their opposing edges firmly dentated, and are employed in seizing and cutting the prey. The right hand pair have their edges bluntly tuberculate, and seem destined for holding, anchor-like, on any fixed objects, and thus mooring the animal amidst the dashing of the tempest-tossed waters. Of the four succeeding limbs on each side, the first two end in small pincers; the rest are simply pointed.



THE LOBSTER.

Along the under surface of the tail, or abdominal, are certain articulated appendages, called false feet. Of these there are five pairs; and all, excepting the first pair, are bifid at the last joint. These false feet assist, perhaps, in swimming; and in the case of the female, are of use in enabling her to affix the eggs or spawn, by means of a glutinous fluid, to the under surface of the abdomen.

Anteriorly, the carapace projects in the form of a dentated spine, protecting the eyes. These are two in number, and are placed on a short movable foot-stalk. Below the eyes are four antennæ, of which the central pair are the shortest and most slender, and they also bifid.

The mouth of the lobster is furnished with two mandibles, two powerful maxillæ, and two palpi, or feelers. In the lobster, and the other species of the group,‡ the tail is the great organ of locomotion, and hence the extraordinary development of the muscles composing its internal structure.

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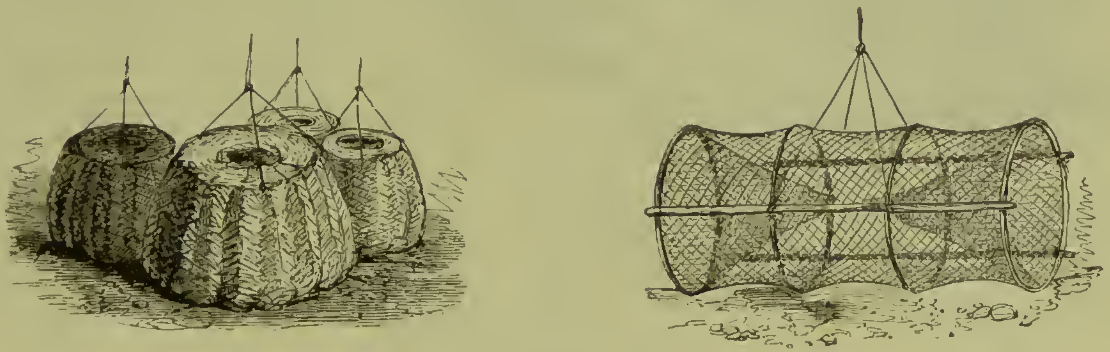
* Astacus marinus. † Astacus. ‡ Macroura.

Clad in hard, unyielding armour, to which, when once formed, no addition, by way of growth, can possibly be made, a lobster changes its calcareous investment at certain intervals, until it is fully mature. Nay more, the covering of the eyes, the cornea, the lining membrane of the stomach, with the teeth, and also the semi-tendinous expansions to which the muscles of the claws are attached, are, as may be seen in the Vivarium of the Zoological Society, all periodically thrown off. It is only when released from their armour that these animals increase. The soft body, liberated from its close imprisonment, suddenly pushes forth its growth; the vital energies are, as it were, summoned to the task of enlarging the frame, and a new investment is acquired, to be again cast off at the appointed period.

In one of these exuviæ, described by Mr. Couch, the sheaths of the antennæ and palpi were perfect to their minutest extremities; the stalk and transparent covering of the eyes were also uninjured. The segments of the posterior part of the body, with the caudal plates, were all joined together without any intervening membrane; and the inferior parts beneath the snout, including the jaws, foot-jaws, chelæ or pincers, and legs, with the sternal plate, œsophagus, and internal coat of the stomach, form one connected portion, with no further separation than would arise from the absence of every portion of membrane.

The manner in which this lobster escaped was not to be mistaken. Through the middle of the carapace, or coat of mail, ran a line as straight as if it had been cut by a knife; and evidently formed by a natural process of separation, for it even proceeded through the centre of the snout to the terminal pointed process, at the root of which it turned off on the right side; so that the least effort of the animal was sufficient to afford it a passage.


LOBSTER POTS.

Lobsters are taken by means of pots of net or wicker-work, of which we give illustrations.

THE COMMON SHORE CRAB.*

This crustacean may frequently be met with. The French, who are as familiar with it as we are, call it very properly *le crabe enragé;* for only attempt to touch it, and it will run along the sand, greatly excited. Seize it before it can succeed in burying itself, its claws become defiant, it will try with all its might to seize and pinch the fingers in which it is held; and if it has no other resource, will leave you grasping a claw or claws, and make off as if it suffered no pain. Any or all the legs may be thrown off on the suffering of injury, but not with equal facility in all the species; for in some, as in the common crab, if they be crushed or broken without great violence, they are sometimes retained, and the crab will in no long time bleed to death. To save the crab, the fishermen proceed to twist off the limb at the proper joint, or give it a smart blow, when it is rejected; and in either case the bleeding is stopped.

According to Mr. Couch, the exuviation of the common crab takes place by a separation of the dorsal from the lower part of the carapace; the animal lying on its back during the process. Prior to this in the crab, and probably in the lobster and others, the fleshy contents of the limb-cases shrink very considerably; otherwise, the flesh of the chelæ in particular could not be extricated, for it does not appear that their shells are fissured. The newly extricated crab—not unlike a lump of dough inclosed in membrane—has, at first, strength enough to crawl to some hole as a place of safety; there it absorbs as much fluid as will distend its organs and their common covering, now flexible as velvet, to the full extent of their capacity. Thus the deposition is made of the calcareous crust, according to the newly-acquired bulk of the animal, which is proportionately the most increased in the youngest individuals.

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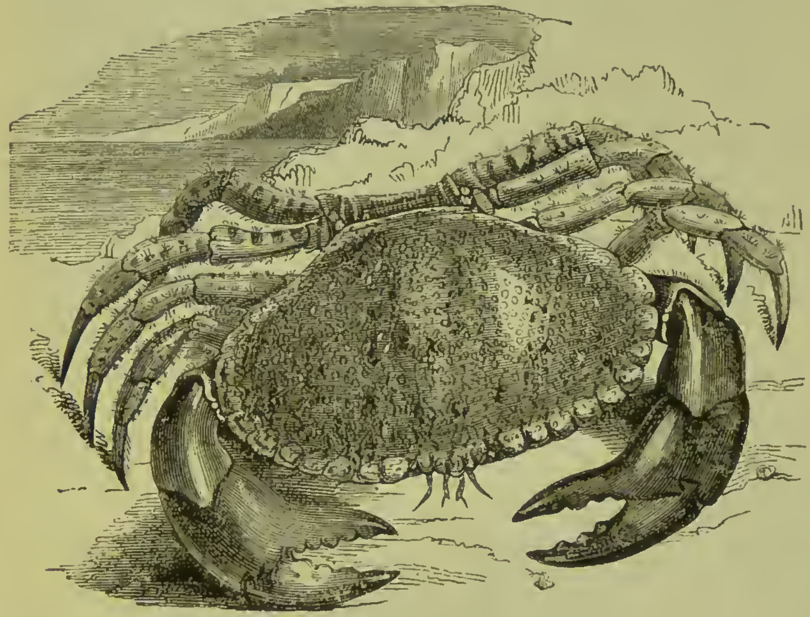
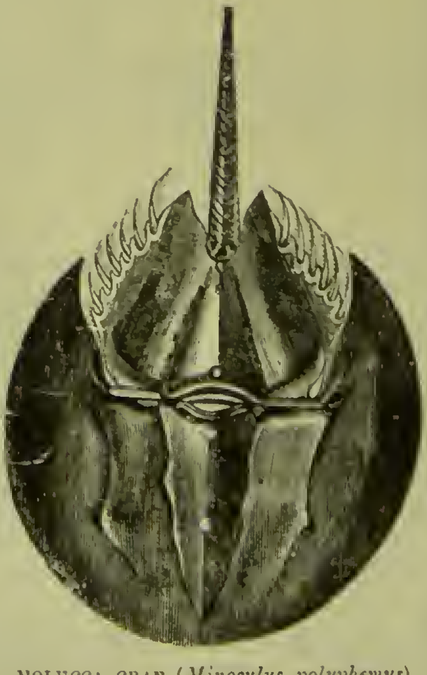
* Cancer pagurus. Carcinus mœnus.



THE CRAB.

THE PEA CRAB.

The Pea Crab is another curious creature, very commonly found in the common mussel on many parts of our coast, and especially in those which are taken from rather deep water. "On one occasion," says Mr. Bell, "I dredged great numbers of these mollusca on the coast of Dorset, and found by far the greater number of them with one or two of these little soft-bodied crabs within their shells; for the females are much more common than the males. The latter sex I have occasionally taken apart from the mussel-shells, the former never. They also occasionally inhabit the common cockle, in which I have now and then found them, as well as very rarely in the oyster." The Velvet Crabs of our coasts, so called from the velvety substance with which the shells are covered, and which extends even to the limbs of the animal, are among the most beautiful in appearance. They are of a reddish colour, tinged with blue. One of them, very commonly found, has colours remarkably bright; it is about two inches and a-half long, and much esteemed for food. We add an engraving of the Molucca Crab.



MOLUCCA CRAB (*Minoculus polyphemus*).

THE HERMIT CRAB.*

The Hermit Crabs have the whole hinder part of the body covered with a coriaceous membrane, instead of a hard, calcareous armour. Apart, then, from some special defence, how could they escape being bruised and broken among the rough stones of a rocky beach, when a rolling tide lashes the shore, or becoming an easy prey to their enemies? But instinct supplies all that is required. The hermit crab selects an empty turbinate shell, fitted to its size, when, introducing its tail, it retreats backwards, and in the recesses of its appropriated dwelling finds security. It is only the right one of its pincer claws that is largely developed, and with this it both shuts and guards the entrance to its home, the caudal paddle of other creatures being unnecessary in this instance. It is changed, in fact, into a sort of anchor, by which the hermit crab retains a firm attachment to the bottom of his dwelling. Here secure, he peers out in quest of prey; and, carrying his castle with him, may be seen, often with others, enjoying his repast.

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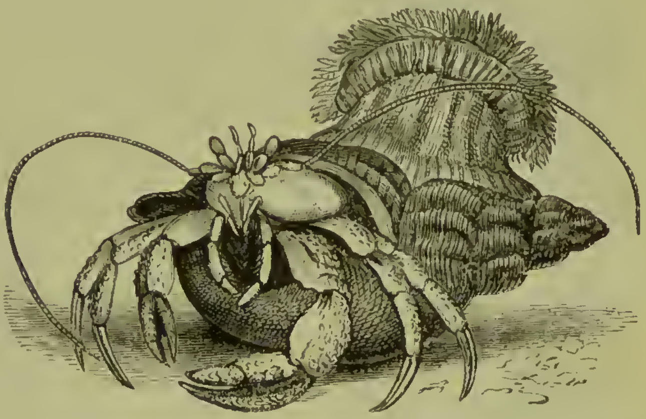
* Pagurus miles.

Unlike the univalve or bivalve, which enlarges its dwelling on increasing its size, the hermit crab, when grown too large for its dwelling, seeks and finds a more spacious tenement. In no race of beings is such a practice known as this. Peculiar, however, as is their sagacity, one species* is specially remarkable for forming so intimate an attachment to the Cloak Anemone, that the latter being fastened to the hermit crab's shell, their mouths are so combined that they always feed together, according most where many other creatures would least agree. On a change of dwelling, the hermit crab has been seen anxiously transferring his friend to his new abode, and even pressing him down with a claw to complete his adherence; and another has been beheld failing to do so, after many efforts, and sooner than give up his friend, returning to endure the inconveniences of his old dwelling!

Of the Crustaceans, however, there is an endless variety; and we can only give an amusing instance of the Green Crab's fox-like craft, as related by M. de Quatrefages:—"One day I threw a large arenicola (*i.e.* lug-worm) into a pool of water several feet in extent. A troop of little shrimps, who were sedately enjoying themselves in the clear element, dispersed in alarm, startled by the noise made by the fall of this strange body, but, recovering themselves in a moment, they rallied, and, while the annelid was endeavouring to bury itself in the sand, one of the youngest, and consequently the most venturesome of the party, seized the creature by the middle of its body. Emboldened by this example, the others lost no time in imitating it, and the poor arenicola was pulled about in all directions, until a full-grown shrimp, darting from behind a tuft of corallines, dispersed his feebler comrades, and appropriated the booty to himself. I soon saw, however, that he would be compelled to divide the spoil, for at that very instant there poured forth from the moving sand some scores of small turbos and buccinums, who, conscious that a victim was at hand, wished to participate in the feast. Without any sign of uncertainty or hesitation, they moved straight forward towards the arenicola, whose body was covered in the twinkling of an eye with those voracious molluscs. I thought his fate definitely settled, when a small shore-crab issued from beneath a stone, put to flight the shrimp, and, by dragging off the arenicola, very nearly upset all the turbos, who forthwith hurried back to their sandy haunts. Then, however, a large edible crab appeared on the scene, and the poor little Mænas was obliged in his turn to beat a retreat, in order to escape out of reach of the formidable pincers of his stronger kinsman. But he still kept a watchful eye over the dainty morsel which he had tasted, and, taking advantage of a moment when the larger crab was withdrawing from the field, from some temporary emotion of alarm, he rapidly seized the long-disputed arenicola, and carried it for safety to some distance from the water's edge, where he might devour it at his ease on dry land."


HERMIT CRAB IN SHELL OF COMMON WHELK, WITH AN ANEMONE ATTACHED TO THE SHELL.

MOLLUSCS.†

THE term by which a vast variety of creatures is denominated is derived from the Latin word *mollis*, meaning soft; as they possess not the hardness of substance common to other animals. Of these creatures the slug, so injurious to the horticulturist and agriculturist, is a familiar example.

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* Pagurus Prideauxii.

† Mollusca.

Linnæus employed the term *Limax*, as a generic appellation for the nude or naked slugs, comprehending under it eight species, all terrestrial excepting one,* to which he assigns the European ocean as a locality.

To the shelly-coated molluscs he applied *Testacea* as the descriptive term ; and as we examine the conchological collections of our museums, we cannot fail to be struck with their amazing diversity and beauty.

Shells exhibit in form the greatest possible variety. Some consist merely of a simple tube or hollow cup ; others present the most graceful convolutions, appearing as cones, spires, and turbans ; while others are shaped like a box, with every diversity of hinge, from that of simple connection by a ligament to the most complicated articulation. As Lamarck strongly recommended shells to the study of the architect, he observed, "There is scarcely any possible form of which nature does not here supply examples ;" and he specifies certain shells which would yield a choice of models for the ornaments of columns, and which are "highly worthy to be so employed." Many of our beautiful stucco ornaments for cornices and chimney-pieces are copied from shells, and are greatly admired.

BARNACLES.

The colours of shells are often so intensely vivid, so finely disposed, and so fancifully variegated, that, as objects of beauty, they rival many choice productions of the animal and vegetable kingdoms, and in some respects exceed them. A feeble impression is received from a *hortus siccus*—a collection of dry stems and leaves—when compared with that which is produced by the living plants and flowers, attired in beauty and exhaling fragrance ; and there is a vast difference, notwithstanding all the appliances of art, between the appearance of the living and the dead animal. And then, whatever care may be taken to preserve a quadruped, a bird, a fish, or an insect for the cabinet, they often suffer from changes of atmosphere and the attacks of various minute creatures. But shells defy assault, and contain no seeds of dissolution : the collection made by the parent may be handed down to the child, and by him transmitted to succeeding generations, in all its pristine beauty and durability. A well-defined group of marine invertebrate animals† must now be considered.

THE COMMON BARNACLE.‡

This animal is often found attached by a fleshy peduncle to rocks, stones, the keels of ships, and masses of floating timber torn off from wrecked vessels. If we take one up and examine it, we find it to consist essentially of a body, inclosed within five delicate valves, or shelly portions, spread upon a tough membrane, which unites them together.

From this body proceed two rows of stems, six in each row, and each of these stems supports two tentacles or jointed arms, with hair-like appendages springing from each joint, forming a fringe along each fibril, while the barnacle is on the watch for its prey.

These arms are protruded, and are themselves, together with their fringes, in constant motion, acting the part of a sweeping-net. The moment some minute tenant of the water is touched, it becomes entangled in their folds, is carried to the mouth of the barnacle, crushed by its jaws, and transferred to its stomach.

THE BALANUS.§

Very similar to the barnacle is the animal thus denominated, whose shells cover in scurfy patches the surface of exposed rocks, as well as drift-wood, or any other submerged substances. These shells are usually white, shaped like truncated cones, and composed of several ribbed pieces closely fitted together, with an aperture at top, closed by an *operculum* or lid, and within these houses the animals are lodged. Like the barnacle, the balanus puts out its arms in search of food, though to a less extent. There are many varieties of both kinds.

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* Limax papillosus.

† Cirripidea.

‡ Lepas anatifera.

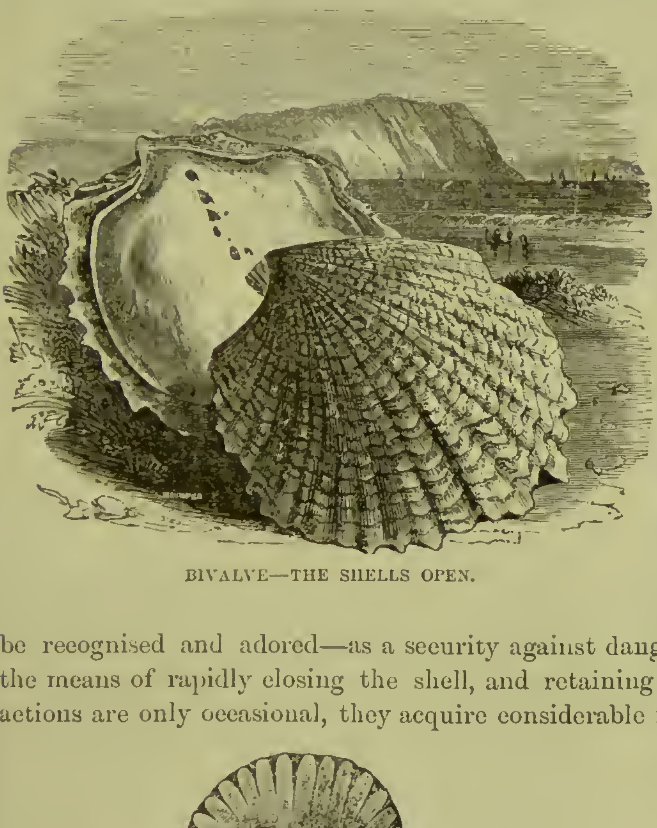
§ Lepas balanus.

THE FURROWED SEA ACORN *(Lepas balanus)*.

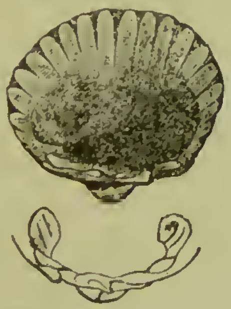
Another class of molluscous animals* is protected by shells consisting of two principal pieces, commonly known under the denomination of bivalves.

The engravings give a good idea of a bivalve without the inhabitant, and of the two shells completely closed.

The two valves of a shell are united at the back by a hinge joint, often exhibiting what would be described, in reference to any human work, as the most exquisite skill, the mechanism greatly varying in different species. The hinge is secured by a very strong substance. In the *unio batava* the ligament is composed of two kinds of texture: the one, which is always external, is perfectly inelastic; the other is, on the contrary, highly elastic, having more of the properties of cartilage, and formed of parallel series of condensed transverse fibres, directed from the hinge of one valve to the similar part of the other, and having generally a deep black colour, and a pearly lustre. The cartilage is always situated within the ligament, sometimes in immediate contact, and forming with it one of the same mass; at other times placed at a distance, in a triangular cavity, amongst the teeth of the hinge. The closing of the valves produces, in all cases, a compression of the cartilage, the elasticity of which tends, therefore, to separate the valves from each other; that is, to open the shell.


BIVALVE—THE SHELLS OPEN.

During the life of the animal, the usual and natural state of its shell is that of being kept open for a little distance, so as to allow of the ingress and egress of the water necessary for its respiration and nourishment. But then—and let the wisdom and goodness of God be recognised and adored—as a security against danger, it was necessary to furnish the animal with the means of rapidly closing the shell, and retaining the valves in a closed state. Although these actions are only occasional, they acquire considerable force, and are effected by a remarkable muscular power. For this purpose, sometimes one, at others two, and at others a greater number of strong muscles are placed between the valves, their fibres passing directly across from the inner surface of the one to that of the other, and firmly attached to both. Still there is no unnecessary expenditure of vital


LIGAMENT OF BIVALVE SHELL.

BIVALVE—THE SHELLS CLOSED.

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* Conchifera.

force; an admirable economy of means is here, as in many other instances, discoverable; the provision is precisely equal to the occasion; but as there is no deficiency, so there is no excess.

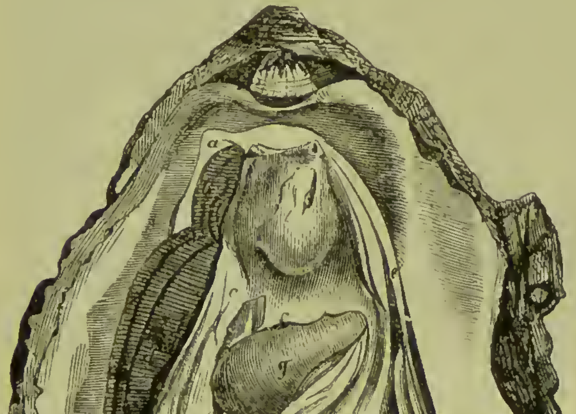
Of this power many an opener of oysters has had full evidence; for there was no little difficulty in working in the point of the knife, and when the two valves were separated it required a considerable wrench to tear them asunder. This is the effect of two strong muscles placed between the valves, their fibres passing directly across from the inner surface of the one to that of the other, and firmly attached to both. In a pair of fresh oyster-shells, weighing 3,488 grains, the entire spring of the hinge weighed three grains and a half; and its elastic power was equal to the pressure of three pounds fifteen ounces avoirdupois, when placed upon the centre of the flat valve, and confined to the insertion of the valvular muscle.

THE EDIBLE OYSTER.*

As the oyster remains fixed and immovable beneath the waters, food as well as air have to be brought to it. This is done, as it is in the case of other molluscs, by an exquisitely minute and most admirable mechanism.

Two vascular laminæ forming the gill-plate, are really sieves to separate suspended atoms from the surrounding water, on its passage from the inhalant to the exhalant orifice—a structure perfectly adapted not only to a breathing, but a feeding apparatus. The action that takes place is as remarkable as the structure; for the tubes that pass between these living sieves lead directly to the exhalant syphon. Thus, when from this the water flows out, there is a tendency to form a vacuum in the chamber and in all the tubes within the gill laminæ; and by this means, combined with the action of the cilia lining the meshes, the water introduced into the branchial chamber by the inhalant tube is drawn to the meshes, and all the suspended particles of matter are retained on the surface of the gill. The water being filtered, as it were, allows the particles to accumulate, and then by the aid of other cilia they are formed into defined streams. This is certainly one of the most beautifully adapted organic mechanisms that can be observed. As a breathing organ it is perfect; and as an organ for securing food it is surely unrivalled for the exquisite beauty of its structure.

To adopt the eloquent words of Professor T. R. Jones: "Wonderful, indeed, is the elaborate mechanism employed to effect the double purpose of renewing the respired fluid, and feeding the helpless inhabitants of these shells! Every filament of the branchial fringe, examined under a powerful microscope, is found to be covered with countless cilia in constant vibration, causing, by their united efforts, powerful and rapid currents, which, sweeping over the entire surface of the gills, hurry towards the mouth whatever floating animalcules or nutritious particles may be brought within the limits of their action, and thus bring streams of nutritive molecules to the very aperture through



OYSTER IN SHELL, THE UPPER VALVE REMOVED.

A, upper portion of the mantle, covering the mouth with its four lips; B, C, the mantle; D, the breathing organs; E, portion of the lobes of the mantle, between which is the extremity of the intestinal canal; F, part of the heart; G, adductor muscle.

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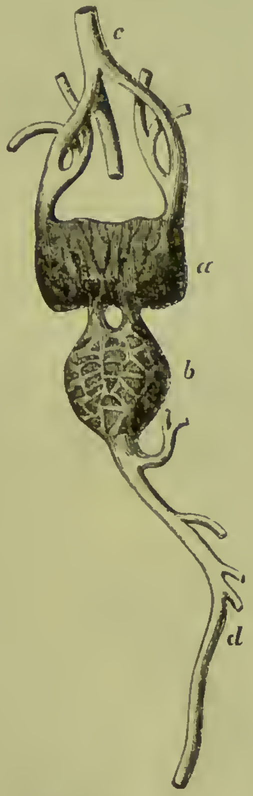
* Ostrea edulis.

which they are conveyed to the stomach, the lips and labial fringes acting as sentinels to admit or refuse entrance, as the matter supplied may be of a wholesome or pernicious character. So energetic is the ciliary movement over the entire extent of the branchial organs, that if any portion of the gills be cut off with scissors it immediately swims away, and continues to row itself in a given direction as long as the cilia on its surface continue their movements."

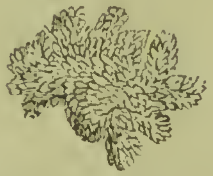
The mouth has four lips, and appears to open into the stomach. The stomach is a kind of bag, placed immediately behind the opening of the mouth, and when, in any instance, the stomach is cut open, it will show the apertures of several large vessels, by which the bile is conveyed from the liver—an organ which entirely surrounds the stomach. The liver is very large, of a greenish and sometimes a dark chocolate colour. Externally, it exhibits a regular series of equal-sized granules, which may be shown by boiling the oyster, and then tearing off its loosened external covering. Internally, it presents arborescent vessels, which converge into excretory ducts, as they approach the stomach. The minute vessels of the liver assume a grape-like figure, common to all the higher orders of animals. The intestine is comparatively short, bending on itself, winding round the liver, and terminating at the part opposite the mouth.



THE HEART.

A, The auricle; B, the ventricle; C, the trunk which brings the blood from the breathing organs; D, the aorta, which, conveying the blood from the heart, completes the circulation.

SECTION OF THE STOMACH, SHOWING THE APERTURES BY WHICH THE BILE ENTERS FROM THE LIVER.

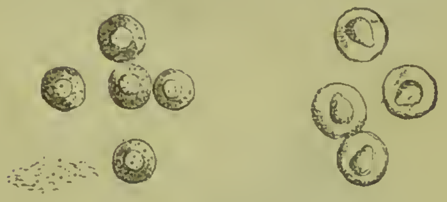


SMALL PART OF THE LIVER MAGNIFIED.

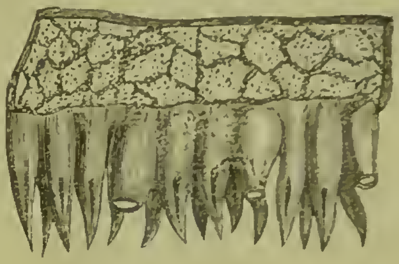
Instead of what is, properly speaking, a brain, two minute detached nodules are observable, each having a few slender nervous threads passing to the neighbouring parts, the longest being affixed to the gullet, and thus it is evident that the chief preserving sense is given to test the articles of food.

The heart, a beautiful structure, is situated in a cavity between the folds of the intestine. It has two chambers: an *auricle*—a name derived from the resemblance of this part in man to the external ear; and a *ventricle*, so called—why, is not very clear—from the stomach. The auricle has walls, extremely thin, composed of the most delicate bundles of muscular fibre; it receives the blood from the respiratory apparatus, and, by contracting, transmits it through two intermediate canals into the more muscular ventricle, that it may be conveyed to every part of the body. The skin, or mantle, wraps up carefully all these organs, and has a surface exquisitely sensitive.

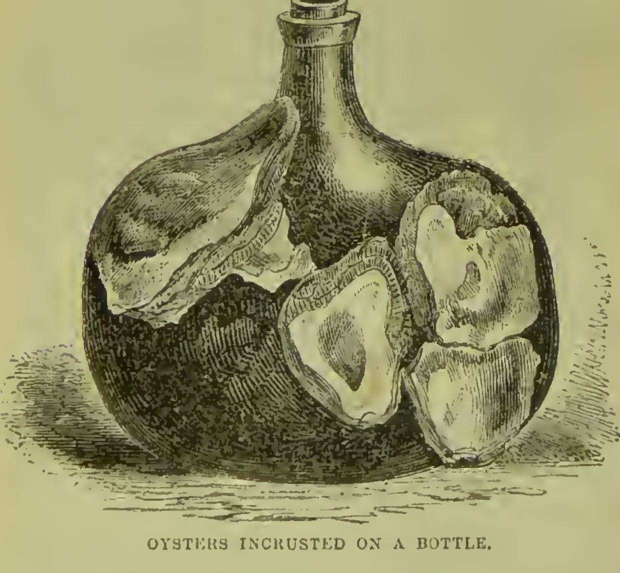
The oyster, at first a living atom, but having a minute shell, is, on the third day of its being, a quarter of an inch wide; in three months it is as large as a shilling; in six months it will cover a florin, and in twelve a crown piece. Here, then, some special provision is obviously needed. Queen Elizabeth visiting her Lord Chancellor Hatton, expressed her surprise at his occupying so lowly a dwelling, when he replied, in true courtier phrase, "Your majesty's bounty has made me *too large* for my house." But an oyster can never become too large for his; for the shell expands precisely according to the growth of the tenant, by a very remarkable process. Protruding just beyond the edge of its shells the rim of its covering, called the mantle, so wonderful in its secretions, this is speedily covered with fluid, which becomes living membrane; the membrane gives out cells, some thousands of which would occupy only the space of an inch; carbonate of lime issues from each one of these, the particles of which, first standing separate, become united, and formed, by their consolidation, into shelly substance. The enlargement of a shell, according to the growth of an oyster, is therefore effected by adding edging after edging to the previously existing valves; and while the outer laying is simply extended by a new growth, an entire new layer is formed in the interior of the old one, and projecting beyond it. The weight and solidity of a shell is secured by the exudation of a kind of calcareous varnish from the general surface of the mantle.



YOUNG OYSTERS,
As seen by the microscope. The germ of the shell is observable in each.



VESSELS OF THE MANTLE.



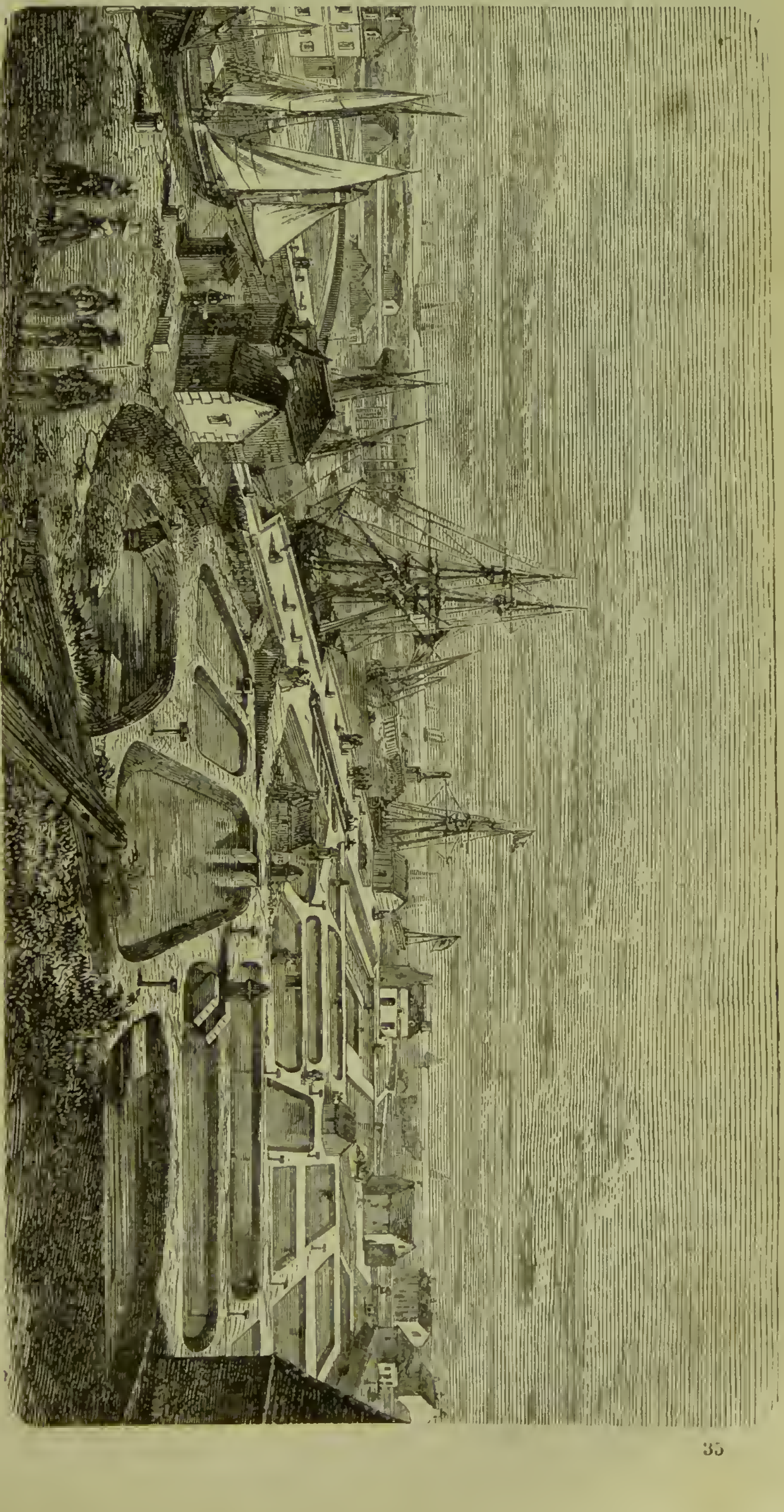
OYSTERS INCRUSTED ON A BOTTLE.

OYSTER IN A TEAPOT.

The oyster usually falls from the surface of the water, on which it gambols for a short time, in its first stage of life, but sometimes it meets with extraordinary adventures. Thus an engraving shows an old-fashioned champagne bottle, taken from the wreck of the Royal George, having on it four oyster-shells or lower valves, all of which are modified in form by the figure of the bottle. The two more immediately in front, instead of being concave internally, are convex, moulded, in fact, by the globose body to which they adhere, so that the oyster, instead of sinking into a bed, must have been elevated or perched up, and consequently covered by an arched or vaulted valve instead of a flat valve; the order of things being reversed. The other two shells show rather how, by the disposition of layer after layer, the oyster makes the best of an unfortunate attachment, than display any decided alteration of the normal character of form. That lying on the base of the neck of the bottle, though somewhat irregular, is fairly concave, and is raised up by numerous rough external layers, acting as an sort of buttress. These shells bear marks of great age, the oysters having lived and died in their present condition. Other shells, of different ages, some very small, are attached to the bottom and opposite side of the bottle.

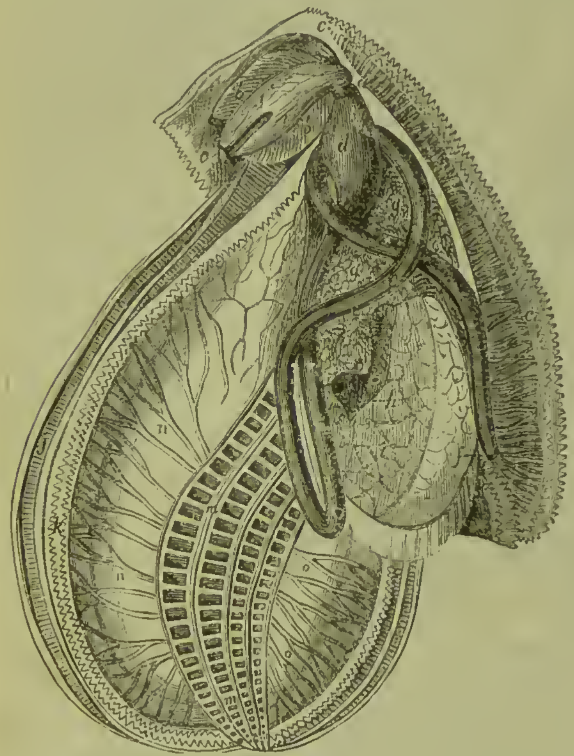
Another engraving represents an ancient Chinese teapot without a spout, but perforated at the spot from which it once projected by three small orifices, like those of a crow-quill, which, being at some time at the bottom of the sea, became the abode of an oyster, either washed into it in its early state, or at some subsequent stage of its progress. In this strange abode the oyster lived and grew, deriving its subsistence from the water that flowed in through the orifices.

Its dwelling, too, became a prison; for the mouth of the teapot was tightly and closely plugged up by the lower valve of the shell. This part rose abruptly from a lower flat margin, extending disc-like, or ring-like, within the vessel, to its swollen circumference, or nearly so; hence the escape of the oyster was impossible, as this substance fitted the mouth of the teapot like a bung. Its surface is transversely marked with lines, the result of growth, and with longitudinal ridges and furrows. It consists of


OYSTER BEDS.

many layers of lime, placed one upon another, to the thickness of half an inch; the whole appearing as if the oyster, clothed in a shell of thick putty or liquid plaster of Paris, had tried to break through its prison-house by pressing upwards, and had thereby converted its shell into a plug, so as to block itself in, the putty or plaster becoming hardened. Such is, at least, the appearance, though not the fact, for the growth and adaptation of form kept pace with each other. This singular dwelling was dredged up in Falmouth River, and is in the possession of Mr. Payne, of Blackheath.

The beds first formed by the Romans have been found necessary, in the rearing of oysters, by all other people. The oyster, when taken from its primal bed, is often wanting in that delicacy of taste which renders it so attractive to many; and hence its removal, so commonly practised, in order to the improvement of its quality. The belt of the Bay of Cancale, for example, appears even, solid, and without current, all favourable circumstances for the reproduction of oysters. The bank, too, must be very extensive, to allow of the continual fishing that has taken place there without any sensible diminution, or only such as has been speedily supplied. Although the French may be said to have the right of fishing in this bay, yet it was long, and is probably still, open to any one who chooses to visit it, at certain seasons, commencing at the end of September, and finishing in April.



ORGANS OF THE OYSTER.

A, the mouth; B, the lips; C, C, the mantle; D, the stomach; E, the intestine; F, its extremity; G, part of the liver; H, the heart; I, the adductor muscle; J, the margin of the breathing and feeding organs; K, the right lobe of the mantle; N, N, O, O, the vessels distributed through the mantle; M, the large canal receiving the breathing and feeding organs.

Some of the London fish-salesmen do business in nothing but oysters. To meet the enormous demand for natives, and to fill the wonderful quantity of Christmas barrels which are travelling all over our southern railways during the month of December, cultivation and protection on a large scale are resorted to; and the more seaward parts of the Thames, on both the Kentish and Essex coasts, may be said to have been long ago converted into a series of oyster-farms or beds, of various sizes. In all these beds, we are informed by Sir Francis Head, "there is a certain space devoted to natives. At Burnham, Essex, the spat, as it is called, is stored in large pits, and sold as native brood, which is afterwards 'laid' in that portion of the different beds appropriated to privileged oysters."

The beds in the channel of the river Colne alone extend over a space of two or three miles in extent, between the villages of Wivenhoe and Brightlingsea. They are the property of the Corporation of Colchester, yielding to it a valuable revenue by grants of licences for the privilege of dredging upon them. The dredgermen are presided over by a jury, formed from among their own members, for the enacting and sustaining of the general and bye-laws of the fishery.

As the number of oysters in these beds is constantly suffering diminution, to supply the market, it is necessary that a communication should be kept up with Corseulles, Granville, and Cancale, on the Norman coast, from whence they can be readily obtained.

We are indebted to a communication from M. Corte, of the College of France, for the following notes on the oyster-beds of the river Gironde:—"The reservoirs in which the fishermen of Marennes deposit the oysters, in order to make them turn green, are called *claires*. These differ from ponds and ordinary parks, inasmuch as they are not submerged by every tide, but only during the spring-tides, when the waves flow further inland than at other seasons. At the end of two or three months the soil, which has been deposited by the inundations in the claires, becomes so firm as to prevent the oysters from sinking into it. In the month of September, when the spawning season is over, the fishing commences. The whole population of Marennes are engaged in collecting the oysters, which they deposit in the ponds, where they increase in size before they are sold. They can be sent to any distance, but from time to time must be immersed in water. Five millions of oysters are annually furnished from the beds of Marennes. Their price varies from one to six francs per hundred—the average cost per hundred being equal to 2s. 6d. of British money." These famed oysters are transported to all countries. From Bordeaux they are forwarded to Marseilles, and from thence to all parts of the south of Italy, and also to Algiers. They have even been found on this side of the Channel.

OYSTER DREDGING.

Alluding to the river which flows into the sea at Aldborough, "the Borough," on the Suffolk coast, which Crabbe has so graphically portrayed, he says :—

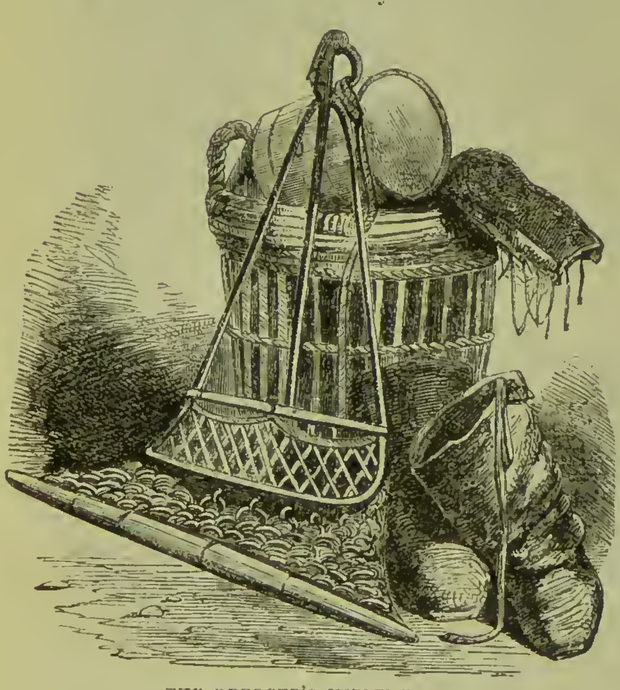
"Thy gentler river boasts its pigmy boat,
Urged on by pains, half grounded, half afloat;
Far other craft our prouder river shows,
Hoys, pinks, and sloops; brigs, brigantines, and snows;
Nor angler we on our wide stream descry,
But one poor dredger, where his oysters lie."

This solitary person is one, however, of a numerous class, with which it is well to make an acquaintance.

A fleet of oyster-boats at work in one of our bays or estuaries, when there is a freshening breeze, is a sight of no little interest, especially if the sun is going down into his home of mist, yet dyeing with his richest colours—amber, yellow, and crimson—the cirrus and stratus clouds through which he has sailed so joyously the whole day, while the waves, instinct with life, are tossing from one to another the liquid gold with which the setting luminary so bounteously arrays them. The sails may be seen flapping to and fro, and then the boat glides darkly by, with the sun edging the sails, the spars, and the red vane of the mast-head. Everything at such a time assumes the richest colours. The vessels—the scene of the dredger's labours—ever in motion, tack to and fro over the oyster-beds, their sails now glowing in the sunlight, and then their bows dashing through the crests of the waves, which in return cast over them a shower of spray, which seems ever and anon like a golden shower. Even the old, brave, weather-beaten hulls which on the beach appear so sombre, when wet with the spray, and dashing back the sunlight, add much to the splendour and gaiety of the scene.

A dredging vessel, more nearly inspected, is moored by an anchor over the oyster-bed, and is often worked by two men and a boy. The net is a strongly made bag with an iron mouth, from which extend three iron shafts, and these converging form a rude handle, and to it the end of a strong rope is attached. This dredge is thrown over the gunwale of the boat, and dropped to the bottom of the water. By the management of the rudder and sail the vessel then gently swings away, so as to run out a certain portion of the rope. The man begins now to draw in the dredge, and as its iron mouth, lying with one of its rims on the bed, acts as a scraper, the net takes up all it can hold.

So far the education of oysters has been left, in a certain degree, to nature; but once in the possession of the fish-shopkeepers, art steps in to perfect their condition. They are now stored in large, shallow vats, being carefully laid with their proper sides uppermost, and supplied daily with oatmeal—a process which is calculated rather to fatten than to flavour; and there are many who think that, like show-cattle, they are none the better for over-feeding.



THE DREDGER'S IMPLEMENTS.

The Edible Oyster, be it remembered, is only one member of a large and diversified family;* we give an engraving of the *Ostrea edulis*, and another of the Mother-of-Pearl Oyster.

The cause of the iridescence of shells has been fully explained by Sir David Brewster, as suggested to him accidentally. He had fixed a piece of mother-of-pearl to an instrument for measuring angles, by a cement of resin and bees-wax. On removing it from the cement when in a hard state, by insinuating the edge of a knife, and making it spring up, he found that the plate of mother-of-pearl had left a clean impression of its own surface, and had actually given the cement the property of exhibiting its peculiar colours. The discovery was therefore made, to his great surprise and delight, that the cause, whatever it might be, of the colours of mother-of-pearl, whenever apparent, does not depend on its chemical nature, but resides on its surface. In the examination of this substance with high magnifying powers, he perceived a grooved structure, closely resembling the delicate texture of the skin at the top of an infant's finger, or the minute corrugations often observable on surfaces which are covered with oil-paint or varnish. The wax, which exhibited the same colours, presented also a similar assemblage of grooves.

Thus, as Sir Isaac Newton has shown that a series of grooves breaks up a beam of light that falls upon them into a number of separate parts, each of which is reflected to the eye from the bottom and sides of the little grooves, and assumes a particular colour according to the angle at which it is reflected, the cause of the iridescence was placed beyond all doubt. Subsequent experiments proved that this singularly beautiful appearance can be transferred to balsam of Tolu, or to gum-arabic, by allowing a thin film to be pressed and to solidify between two pieces of mother-of-pearl; or it may be communicated by hammering to a clean surface of lead, or to the well-known compound of mercury and bismuth, which forms a fusible metal. Different specimens of shell give, of course, very different results as to the fineness and number of the grooves. Sometimes a magnifying power of six or eight times will render them readily perceptible; in some instances two thousand grooves have been counted in the space of an inch, while in others their numbers were wholly incalculable. It is very remarkable that grinding will not obliterate these grooves. It might naturally be supposed that, as the grooves must be separated by slight ridges, those ridges would be worn down in the process of grinding. But as the ridges wear down, so also do the grooves; so that, however thin the film may be rendered by grinding, the grooves and the colours resulting from them will still be apparent. Still further; if the surface have any scratches or dents, the bottoms and sides are grooved just as if the surface had been level.

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* Ostrea.

FUCUS LONGISSIMUS. CORAL FIXED ON A MOTHER-OF-PEARL OYSTER. VOLUTE. HORNED MUREX.

When examined under the microscope, this substance, exhibiting a series of grooves, is supposed to consist alternately of layers of membranous and calcareous matter. Dr. Carpenter has shown that when the layers are decalcified, they exhibit the iridescence, but that when the corrugations are removed by stretching, the membrane no longer exhibits its rainbow-like hues. This substance, moreover, is often traversed by tubes, which vary from the $\frac{1}{20000}$th to the $\frac{1}{2000}$th of an inch in diameter. Their direction and distribution are exceedingly various, but generally they form a kind of net-work, which spreads itself out in each layer. At other times these tubes are quite straight. They are regarded as originating in a coalescence of a series of cells; but this structure is not often observed in the nacreous substance.

The passion for pearls was at its height about the period when Roman freedom was extinguished, and in the imperial city pearls were valued as highly as precious stones. A pearl, celebrated in Pliny's time, was bought by Tavenier for £10,000. In Asia this taste was of more ancient date, nor has it ever declined. A string of pearls of the largest size is an indispensable part of an Eastern monarch's decorations. It was thus that Tippoo was adorned when he fell before the gates of his capital; and the rulers of Persia have for ages been similarly decorated.

Shakespeare gives us the following colloquy:—

> *Cleopatra.*—How goes it with my brave Antony?
> *Alexas.*—Last thing he did, dear queen,
> He kiss'd—the last of many doubled kisses—
> This orient pearl;—his speech sticks in my heart.
> *Cleopatra.*—Mine ear must pluck it thence.
> *Alexas.*— "Good friend," quoth he,
> "Say, The firm Roman to great Egypt sends
> This treasure of an oyster."

Again, the poet says—

> "Honesty dwells like a miser in a poor-house, as your pearl in your foul oyster."

The pearl oysters, like those with which we are familiar, lie in banks, at greater or less depths in the sea. Such banks, for example, occur on the western side of the island of Ceylon, about fifteen miles from the shore, where their average depth is about twelve fathoms. Here the greatest of all pearl fisheries has been carried on for many centuries. They seem always to have been considered the property of the king or kings of Ceylon; but since the occupation of the island by the British, the privilege of fishing on them has been sold sometimes by auction, the sales being made only for one season.

The pearl fishery always begins in the month of April, because the sea has then a beautiful tranquillity; and it is generally continued to the middle or end of May. It attracts to the coast not only a multitude of the Cingalese, but crowds of speculators from all parts of the vast Indian peninsula, whose variety of language, costume, and manners is described as very striking and pleasing. On the eve of the fishery there is a curious and picturesque spectacle.

The signal for beginning the fishing is given at daybreak by the discharge of a cannon; on which a countless fleet of boats, that have started for the shore at midnight, and, favoured by a land breeze, have reached the oyster-banks before dawn, cast anchor in the respective parts for which their owners have contracted, or at which they are appointed to work. Inspectors are in attendance to prevent any irregularity in these respects.

The boats generally carry a captain, a pilot, and twenty men, ten of whom are experienced divers. The ten divers are divided into two companies of five each, and these companies plunge and relieve each other by turns.

That they may descend through the water with greater rapidity to the bank round which the oysters are clustered, the divers place their feet on a stone attached to the end of a rope, the other end of which is made fast to the boat; they carry with them another rope, the extremity of which is held by two men in the boat, whilst to the lower part that descends with the diver, there is fastened a net or basket. Every diver is also provided with a strong knife to detach the oysters, or to serve him as a defensive weapon if he should be attacked by a shark. On touching the ground, they gather the oysters with all possible speed, and, having filled their net or basket, they quit their hold of the rope with the stone, pull that which is held by the sailors in the boat, and rapidly ascend to the surface of the sea.

In spaces of ground called coultôs, inclosed with poles and transverse pieces of bamboo, but open to the air, the oysters are deposited on being landed. They are here left to putrefy, which they soon do under a burning sun; and it is a curious fact, that though these numerous coultôs, each one containing an enormous mass of oysters, all putrefy together, emitting the most detestable odours, yet the health of the precarious but crowded population gathered there is in no ways affected. "During two years that I did duty at the fishery," says M. de Noé, now a peer of France, but formerly one of the French emigrants, and an officer in the British army, "I never saw a soldier of my regiment sick; Europeans and sepoys all enjoyed good health;" and it has been remarked, on other authority, that in this climate, where the effects of vegetable decomposition are so fatal and so rapid, those of animal decomposition are almost innocuous.

As soon as the putrefaction is sufficiently advanced, the oysters are taken from the coultô, and placed in troughs made of the trunks of trees hollowed; sea-water is then thrown over them. The pearls are now readily shaken out and washed, by men who stand on one side of each of the troughs. The largest are carefully picked up, and washed repeatedly with clean water; the next in size and quality are merely taken from the trough and spread out on white napkins to dry in the sun; and it is not till this is done that any attention is paid to the smallest pearls, which are generally left to the care of the women, who pick them up and dry them.

To assort the pearls afterwards they make use of three sieves, placed one above the other. The apertures in the uppermost sieve are the largest, and the apertures of the second sieve larger than those of the third; and by this means the class of the pearls is determined. It remains, however, for an after examination to decide on other qualities which give value to the pearls, as their regularity of form and their colour. Little as it might be supposed, great importance is attached to the colour; for while Europeans most esteem the pearls that are of a pure white, the Cingalese prefer those which are rose-coloured; and the Indians, and some other Orientals, the yellow pearls. Besides pearls of these three colours, others are found of a delicate blue tint, while some have a golden and others a silvery hue.

Pearls of an inferior description are formed in a fresh-water bivalve.* Some of these were exhibited in the Great Exhibition of 1851, which were obtained from the deepest parts of the River Strule, near Omagh. Similar pearls were also shown from the River Ythan, Aberdeenshire. It is probable that pearls from this source, collected by the ancient Britons, may have given rise to the statement by Tacitus in his "Life of Agricola," of pearls, "not very orient, but pale and wan," being among the indigenous products of Great Britain. Pearls of the same kind have also been procured from Conway, in Wales, as well as from Sweden and Norway.

The smaller kind of pearl, called "seed-pearl," is procured at Kurrachee, on the Bombay coast. They are of little value, except to the Persians and some of the Hakeems of India, who esteem them as medicine. The oysters producing "seed-pearls" are washed up by the surf-waves to high water mark, and are left there as the tide falls. They are gathered by Coolies employed for the occasion, put into boats, and landed at Keamaree Point. There the shells are broken and the pearls extracted, under the superintendence of the contractors, who pay the Julpore Government forty thousand rupees per annum for the pearl contract. Even the gleaners who come after them pay for the right of sifting the broken shells in search of any pearls that may remain.

The origin of pearls has led to much discussion, but it should be remembered that the instinct of every shell-dweller is prepared to meet all the exigencies of its being. However rough and rugged be the exterior of its abode—gradually adapted to its growth—the interior is invariably made exquisitely smooth, and often highly iridescent. And should some grain of sand or other substance enter its dwelling, and be likely to irritate its tender body, it wraps it up in the iridescent substance which it secretes at pleasure, and changes it into a pearl!

In the engraving of the Mother-of-Pearl Oyster (page 277), a coral appears growing on the upper valve; and the tenants of such molluscs, in all seas, are various and numerous. Professor Allman, a very vigilant and careful observer, found, for example, at a supper-table, an oyster-shell infested by various creatures. On looking more intently, he discovered, what eyes less acute would have failed to perceive, some small white dots, irregularly placed on the surface of the fronds of some of these parasites. Laying, therefore, the oyster-shell aside for further examination, and submitting a fragment to the microscope on the following day, he was soon rewarded with a sight of a delicate, glossy fan, and, in fact, with the discovery of a new plant. Each of the minute dots was now seen to consist of one or more, frequently of a cluster, of transparent, fan-shaped bodies. Each dot, or cluster, crumbled under the touch, being composed of carbonate of lime; not as an incrustation, but as intimately incorporated with the tissues of the plant.

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* Unio margaritifera.

In our sea-side walks, we may often see—

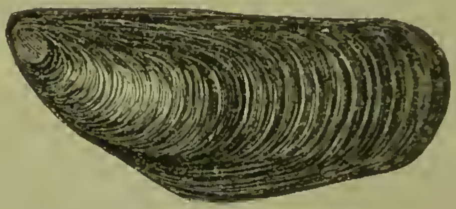
> "Rocks, rough with limpets and brown tangle weed,
> Jut here and there—whilst on the sturdy cliff
> Its cable sure the crafty mussel spins,
> Lashing itself for safety to the rock.
> Here and there,
> Speckled with slaty spots of green, that tell
> Where 'neath their emerald fringes cockles hide,
> Strange shells, the marvels of old Ocean's bed,
> Are strewed around. Have they been always here?
> Or came they hither from far distant shores,
> Unwilling captives of careering waves?"

The limpet * here noticed is not a bivalve: it is nearly round and conical; and on account of its form, the Romans distinguished the animal by the name of *patella*, their term for a small, deep dish. No mollusc is more common than this. Dr. Johnson, of Berwick, calculates that 11,880,000 limpets are used annually as bait.

THE COCKLE.†

The showy-ribbed shell of this creature is familiar to everybody, being found all round our coast, wherever there is any sand. They form no despicable food when roasted or boiled, serving also for a good fish sauce when prepared with butter. Many cockles are gathered on the sandy shore by children, and eaten raw, and in some places numbers of them are pickled.

THE COCKLE.


THE MUSSEL.

The Tuberculated Cockle, and another creature, the Spiny Cockle,‡ which it greatly resembles, are found in abundance on the Paignton sands, in Torbay, where at low tide they may be seen with their fringed tubes just appearing above the surface of the sea. The neighbouring cottagers collect them in baskets, and after cleansing them in cold spring water, fry the mollusca in a batter made of crumbs of bread, producing a wholesome and savoury dish. They call them Red Noses.

THE COMMON, OR ROCK MUSSEL.§

This mollusc may be seen covering by thousands the surface of rocks near low-water mark. It always chooses the most open situations; but here it is as firmly anchored as a ship in harbour. Its foot, which is not required for progression, weaves, some say, a byssus of silken threads, which are very strong, and thus provide secure means of attachment. De Blainville, however, describes it as an assemblage of muscular fibres, dried up in one part of their extent, still contractile and in a living state at their origin—a condition which they enjoyed throughout their whole length at the period of their attachment.

Wholesome as the mussel is in general, it seems greatly to disagree with some persons. Fortunately, however, illness from eating them is very rare, and so valuable are these molluscs as food, that small portions of the sea-shore between the tide-marks are, in some places, surrounded by stones, and called "mussel gardens," and carefully watched by the proprietors. The fishermen of Northumberland have been seen employed in piling up stones among the rocks to secure their mussels.

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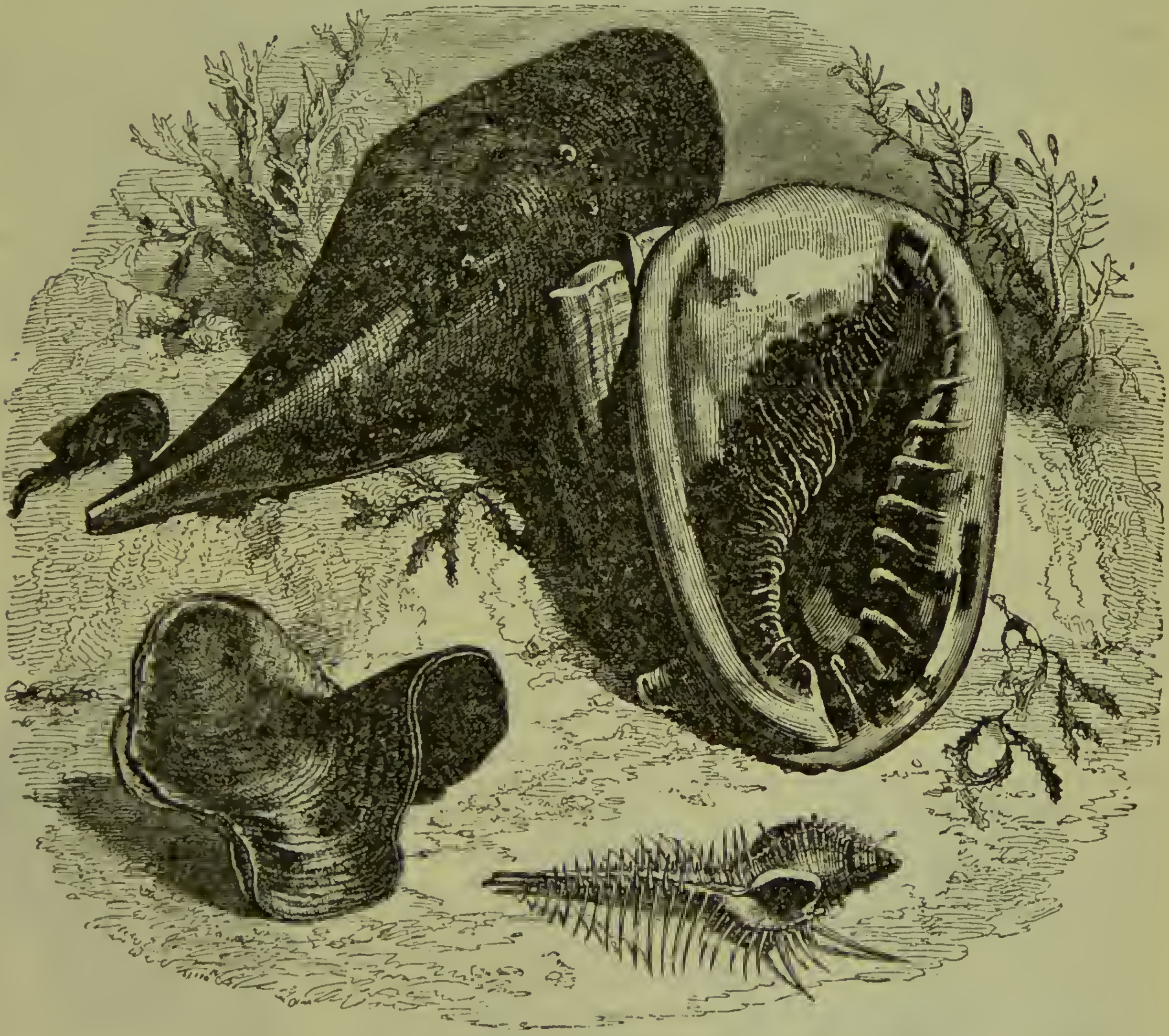
* Patella vulgata. † Cardium edule. ‡ Cardium echinatum. § Mytilus myosus.

Dr. Knapp says :—"As an article of food, there cannot be used fewer than ten bushels per week in Edinburgh and Leith, say for forty weeks in the year ; in all, 400 bushels annually. Each bushel of mussels, when shelled and freed from all refuse, will probably contain from three to four pints of the animals, or about 900 or 1,000, according to their size. Taking the latter number, there will be consumed in Edinburgh and Leith about 400,000 mussels." This, he adds, is a mere trifle compared with the enormous numbers used in bait for all kinds of fish. At Newhaven alone, he calculates that the annual consumption of mussels for this purpose only may be reckoned at 4,320,000 ; and as there are nearly as many used in Musselburgh, and various other places in the Frith of Forth, he estimates the annual use of them by the fishermen of that district, for bait only, to be thirty or forty millions a year.



LARGE SHELL FROM THE MEDITERRANEAN, WITH ITS BYSSUS. HELMET SHELL FROM MADAGASCAR. SADDLE-LIKE SHELL FROM MALABAR. FINE-THORNED MUREX.

In the engraving appears the byssus of a large shell brought from the Mediterranean. In the Great Pinna of this sea, the byssus is well and largely developed, and its situation is in a fleshy sac or sheath at the base of the foot, which is attached towards the middle of the abdominal mass of the animal. In Italy, it is manufactured into various articles ; and there are few museums without a glove or a stocking woven out of this substance. Some stockings of this silk were presented in 1754 to Pope Benedict XIV. In the Great Exhibition of 1851, a large number of articles were exhibited manufactured from this substance, as well as specimens of the silk for making up.

THE PECTINATED PINNA.*

THIS is the largest two-valved shell-dweller that our British seas produce. It is sometimes twelve inches long, and has a byssus, consisting of numerous silky threads of a dark purplish colour, and often two or three inches in length.

THE RAZOR SHELL.†

THE RAZOR-SHELL.

THIS mollusc has a foot of remarkable power. It is of a cylindrical shape, tapering at the end, and strongly resembling a tongue. When, however, the Solen is preparing to form a dwelling in the sand of the sea-shore, the foot takes the form of a shovel, sharp at one end, and ending in a point, by the aid of which a hole is dug; it then alternately assumes the shape of a hook and a spade—one assisting the solen in its descent, the other shovelling out the sand. When the solen wishes to change his abode, the foot assumes the form of a ball, to prevent him slipping back, while the reaction of the muscles throws him forwards. With this singular instrument the solen can burrow with great rapidity, penetrate several feet, and baffle all endeavours to capture it.

The Pod Razor-Shell‡ is the largest British species, varying in length from three or four to eight inches. It is covered with a thin skin, of a light brown or olive green, which, when rubbed off, shows a few bands of dull purple. The Sabre Razor-Shell§ is as plentiful on sandy places as the other species.

THE SCALLOP.

THE SCALLOP.

EVERY sea teems with some of the numerous species of this creature. The people of our coasts are accustomed to cook the mollusc either with bread-crumbs in its shell, or fried for the table; and the women and children to form the shells into pincushions and watch-pockets. Linnæus considered such shells, found abundantly among oyster-beds, to belong to the same genus as the oyster—to be a kind of rustic tribe to the suburban natives; but as scallops differ alike in themselves and their shells from the oyster race, they have been detached from oysters by later naturalists. The French call these shells pelerines, or pilgrims, and they are still called in other countries, and especially in Spain and Portugal, shells of St. James, because the pilgrims to the shrine of St. James were accustomed to ornament their cloaks and hats with them: no symbol of pilgrimage, indeed, was better known than the scallop shell. Thus, in a masque in the presence of Queen Elizabeth, a pilgrim appeared "clad in a coat of russet velvet, fashioned to his call, his hat being of the same, with scallop shells of cloth and silver," doubtless in conformity with the ordinary representations of St. James himself, though in Spain he frequently appears, like our St. George, an armed cavalier.

Three Popes—Alexander III., Gregory IX., and Clement V.—actually issued bulls, exclusively granting to the Archbishops of Compostella a faculty to excommunicate all persons who should sell these scallop shells to pilgrims anywhere except in that city. Fuller—that fine, quaint old writer, who abounds in recondite learning, and yet can use it with unwonted interest—asserts that the scallop shells were assumed because they were used for cups and dishes by pilgrims in Palestine; and he derives the armorial bearings of the Villiers family—a cross charged with scallops—from the Crusades. The term escallopée, used in heraldry, denotes a shield formed all over with scalloped shells, not placed immediately one under the other, but each overlaying part of two. Ophelia asks—

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* Pinna pectinata. † Solen. ‡ Solen siliqua. § S. ensis.

> "How should I your true love know
> From another one?
> By his cockle-hat and staff,
> And his sandal shoon."

SCALLOP FISHING.

The cockle she refers to is, in fact, a scallop. There are limes and scallops, too, which are called "the butterflies of the ocean," not only from the delicacy and beautiful colouring of the wing-like shell, but also from their agile motions. It is only for one of these creatures to open the valves of its shell, and suddenly to close them, and it so discharges the water that the lime or the scallop is impelled onwards or upwards. When this force is spent, it repeats the operation, thus taking long and rapid leaps, and shooting hither and thither in an irregular and zigzag course.

Another class of molluscs is very numerous, occupying, as they do, Univalve Shells, consisting of a single piece. Of these, the Snail is the most familiar example.

The animals which inhabit such shells rise in the scale of being above the *Acephala*, as oysters, mussels, &c., which are headless. The part which acts as a foot is a broad expansion of fleshy substance, occupying nearly the whole under surface of the animal, and forming a flat disc, capable of being applied to the surface on which it moves. In some species it cuts its way like a ploughshare. All are fully prepared for their circumstances.

THE SNAIL.

The effect of the actions of the animal is that different parts of the plane on which it moves are successively laid hold of, and each corresponding part is dragged along, so that the body advances by a slow and uniform gliding motion. The operation of this organic provision may be easily seen by making a snail crawl on a pane of glass, and viewing the movement of its disc from the other side of the glass. A curious and interesting spectacle is produced by the regular undulations which advance in the direction of the motion of the snail. Other endowments of these creatures are worthy of notice. The sense of smell is clearly possessed by slugs and snails; for fresh food, as Swammerdam observed long since, attracts them towards it. The seat of the faculty was long a matter of dispute. Cuvier surmised that the whole surface of the skin might have the power of detecting odours, as if each creature were an animated and independent *nose.* But Owen has recently shown that in the Nautilus, at least, there is a distinct organ of smell; and other naturalists have demonstrated that, in the far inferior race of sea slugs, their smelling organs are elaborately constructed.

Strange as it may seem, the sense most generally distributed among shell-covered creatures is that of hearing. The ear is an exceedingly curious structure, consisting of one or more parts, each supplied with its special auditory nerve. In this little cavity are contained sparry, crystalline bodies, composed of carbonate of lime, varying in number in different species. These minute bodies are in constant motion, vibrating backwards and forwards, rotating on their own axes, or rushing with violent motion towards the centre of their prison, whence they are as violently repelled. Thus, fact after fact is revealed to us, at once to encourage and reward persevering research. "In these discoveries," says Dr. Johnston—himself an illustrious instance of his own remarks—"you have a lively example of the nicety of anatomical researches in our times. In my student days it was questioned whether any molluscs besides the cuttle fishes had eyes, and it was agreed on all hands that they were earless and deaf."

UNIVALVES.

More remarkable still, the common Scallop, so much like an oyster, has not only eyes, but they are placed in a very extraordinary position, being arranged in shining rows along the borders of the creature's mantle, starring the edges immediately within the margin of the shell, and in front of the tender gills: as if a man should bear a row of eyes instead of buttons on his coat and vest—a place for them by no means improbable or inconvenient if he were without a head.

A univalve still recalls the poet's words:—

> "Shake one, and it awakens. Then apply
> Its polished lips to your attentive ear;
> And it remembers its august abodes,
> And murmurs as the ocean murmurs there."

Nor should it be overlooked that Wordsworth conveys the idea still more fully:—

> "I have seen
> A curious child applying to his ear
> The convolutions of a smooth-lipped shell,
> To which, in silence hushed, his very soul
> Listened intensely, and his countenance soon
> Brightened with joy; for, murmuring from within,
> Were heard sonorous cadences, whereby,
> To his belief, the monitor express'd
> Mysterious union with its native sea."

The structure of these univalve shells is marked by very striking peculiarities. In some instances, in consequence of the situation of the heart and great blood-vessels relatively to the spiral of the shell, the left side becomes more active than the right, and secretions are made in that direction; while there are a few species in which, from the situation of these essential organs, the right becomes more active than the left side, and a spiral shell is produced.

THE WENTLETRAP.

This creature, a frequent shell of our coast, is an example of spiral shells. The ribs are somewhat thick and smooth, and sometimes they are marked with purple spots, while the whole shell has occasionally a pinkish purple tinge. Of the Wentletrap more than eighty species are now known. The Royal-staircase Wentletrap was once so rare that a fine specimen was sold in England for twenty or thirty pounds, and in France for a hundred louis; but now it is common, and a few shillings will secure its purchase. It is curious to observe that in these spiral shells, the whorls, as the successive ridges are called, almost always turn to the right, from the left side, where the heart and blood-vessels are placed, being the most active. Some of these spiral shells have a door nicely adjusted to the little dwelling, more or less resembling that of the snail.

THE WENTLETRAP.

In all such instances the apex of the simple, as well as of the spiral cone, is the part first formed, and which protected the animal at the moment of its exclusion from the egg. The succeeding turns made by the shell in the progress of its growth, enlarging its diameter as they descend, form, by degrees, a wide base. As the body extends towards the mouth of the shell, the posterior end often quits the first turn of the spire, and occupies a different part of the dwelling; the cavity at the apex is then filled up with solid calcareous matter, not inferior to marble in hardness.

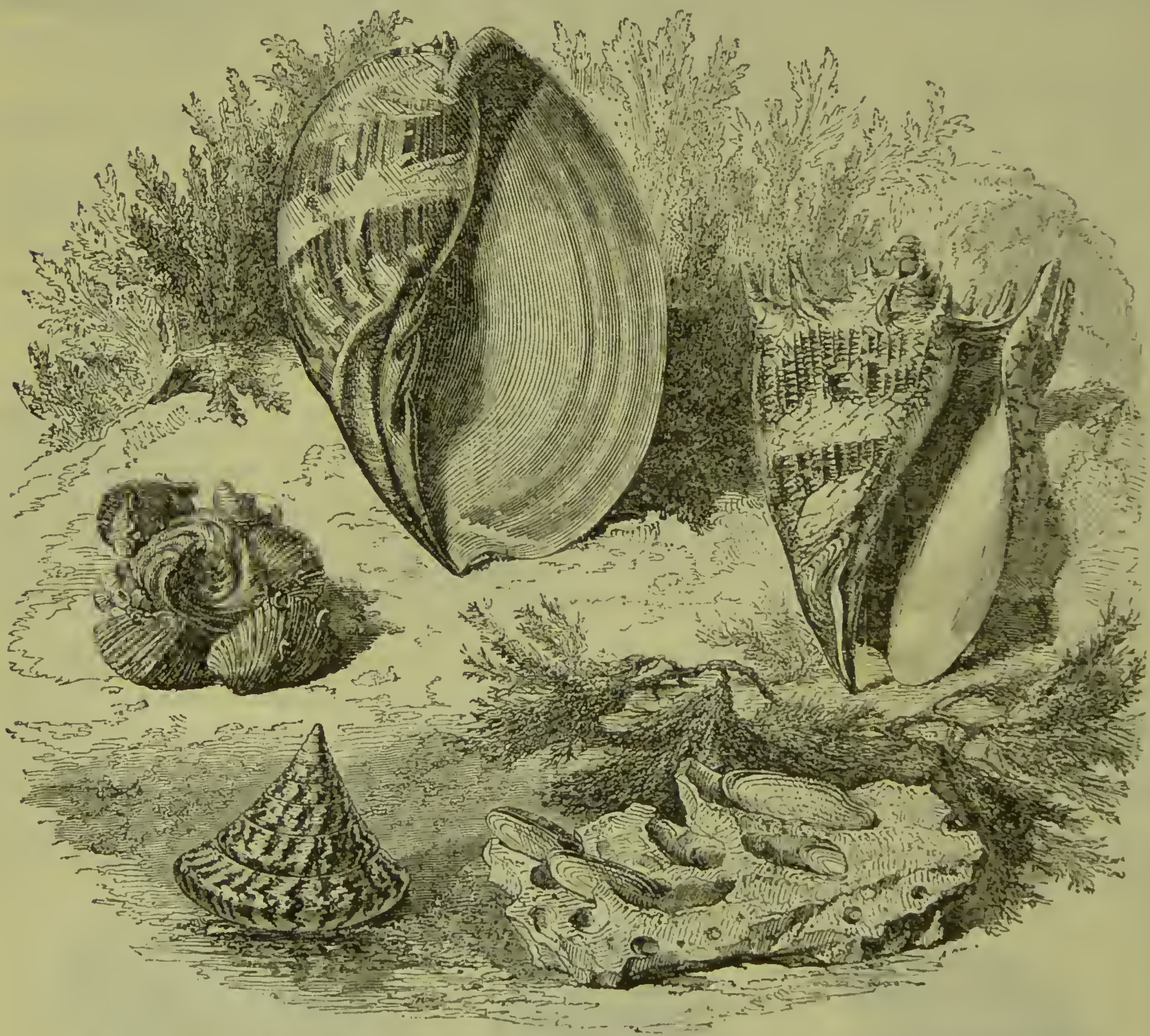
It has been remarked by Dr. Gray that the nucleus which forms the original apex in all shells, and frequently remains attached to them during all the periods of their growth, is largest in those shells the animals of which are viviparous, and is, consequently, very distinct in *Volutæ*, *Paludinæ*, and *Cyclades.* "In the oviparous species," he observes, "it agrees in size with the egg of the animal; thus, *Achatina octona*, which has an egg nearly equal in dimensions to the mouth of the shell, and *Bulinus ovatus* and *B. bicarinatus*, which lay large eggs, have large nuclei, the magnitude of the nucleus in general rendering the top of the spire blunt. Some, on the contrary, as *Stylina* generally, and *Pupa purpurea*, have a very long, slender, acute turreted nucleus. The form and size of the eggs of these molluscs do not appear to be known."

Some of these shells are specially compact, and therefore ponderous. The animal matter, more equally blended with the earthy particles, binds them very strongly together. In shells of this kind the carbonate of lime has more or less of a crystalline arrangement, the minute crystals being rhomb-like, having equal sides, and the opposite side parallel; but the angles are equal, or else like *prisms*, whose bases or ends are any similar plane figures, and whose sides are parallelograms. In the latter case the fibres are short, and the prisms are generally hexagonal; but, in the former, they are composed of three distinct layers, each of which is formed of very thin plates, marked by oblique lines, which show the direction of the crystalline fibres, so arranged as to give strength to the shell.

SHELLS STRENGTHENED BY RIBS AND BOSSES.

The plates which form the rhombic crystalline cells are deposited in succession, each gradually increasing in thickness as the shell enlarges. As the mollusc grows, the lip gradually shelves, matter is deposited in a crystalline form, so as to give it a translucent character; but occasionally this object is not effected, and the cell is filled with air, and presents the dark appearance known to be produced under the microscope by transparent vessels containing air. That these cells are deposited by successive layers appears from the fact that, when the decalcified layers are examined, they exhibit a series of transverse lines, not unlike the transverse striæ of muscular fibre. In the shells which do not present the prismatic cellular tissue there is seen a layer of membranous shell-substance, but no cells can, for the most part, be discovered.

Sometimes the mantle of the shell-dweller is suddenly developed in particular parts, which become rapidly enlarged, and strike out into long slender processes. Every part of their surface is able to secrete and to form shell, so that the portion consolidated around each fleshy process has, necessarily at first, the shape of a tube closed at the end. As fresh deposits are made by the secreting surface inside the tube, the internal space is gradually filled up by these deposits, each process making way for their reception. Every part of the cavity is obliterated in the course of time, and the process of the shell becomes entirely solid. Thus originate the many curious projecting arms or spires which shells often exhibit, and which have arisen periodically, during their growth, from their outer surface, as in the Spondylus (see page 287), and the Thorned Murex (see page 281).

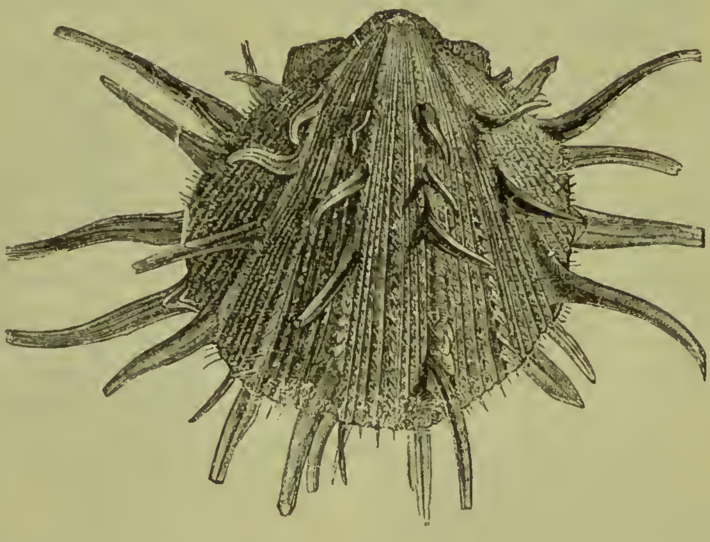


CROWN VOLUTE. IMPERIAL VOLUTE. TROCHUS AGGLUTINANS. TROCHUS FROM THE SEAS OF NEW HOLLAND. STONE-BORING PHOLADES.

On the inner surface of the Volute, and other shells of a similar kind, a layer, of a hard, semi-transparent, calcareous material, having a vitreous appearance, is deposited. The thickness of the layer, which thus lines the cavity of the shell, is greater as it approaches the apex; and when the spire is much clongated or turreted, as it is called, this deposition entirely fills the upper part, which, in the early stages of the shell, was a hollow space with thin sides. Thus, solidity and strength are given to a part which, by remaining in its original state, would have been extremely liable to be broken off by the action of the sea. In other instances, instead of fortifying the interior of the apex by a lining of hard shell, the animal suddenly draws its body from that part, and builds a new wall, or partition, across the cavity, so as to protect the surface thus withdrawn. The abandoned portion of the shell being very thin and brittle, and having no internal support, soon breaks off, leaving what is called a *decollated* shell.

The young of one genus, *Magilus*, has a very thin shell of a crystalline texture; but when it has attained its full size, and has formed for itself a lodgment in a coral, it fills up the cavity of the shell with a vitreous deposit, leaving only a small conical space for its body; and it continues to accumulate layers of this material, so as to maintain its body at a level with the top of the coral until the shell is entirely buried in the vitreous substance.

Another remarkable process is sometimes called into action, in order to the symmetrical growth of a spiral shell. A *Triton* or a *Murex* (see page 281), for example, has the intervals of growth marked by the elevated varices. In the direction in which, so to speak, the shell is rolled on itself, there appears a thickened, spreading, inner lip, into which the varix descends. Now, both these must be removed, in order that the progress of the shell may be uninterrupted; for if these shells be examined internally, they will be proved to be perfectly smooth, and what was once outside will now be inside. There must, therefore, be a great power of absorption to remove the masses of shell which are contained in the highly-elevated and wrought varices, for such in many shells they are, to say nothing of the thickened lip.



THE SPONDYLUS.

Nor are these solitary instances of absorption. The Cone and the Olive shell have a form which allows only a small space for the convolutions of the animal's body, and therefore to enlarge it the whole of the two outer layers of the inner whorls of the shell are removed, leaving only the interior layer, which is therefore very thin when compared with the other whorl that envelopes the whole, but which, retaining its original thickness, is of sufficient strength to give full protection to the animal. Instances, indeed, occur of the total removal of the interior whorls of shells, as is the case with the genus *auricula*. In the young shell the partitions which separate the cavities of the whorls are incomplete, and twine parallel to each other; but they wholly disappear as the animal approaches maturity.

No one would imagine it, and yet creatures designed to live in rivers can adapt their shells to a marine life, should that become necessary. Professor Edward Forbes, and his friend Captain Spratt, observed, for instance, certain fresh-water tertiary strata in the Island of Cos. They appeared in ascending succession, lying against a mass of scaglia, and were unconformably surmounted with a marine formation. In the lower stratum there were shells of well-known species of fresh-water molluscs, especially *Paludina* and *Vereitina*; and, as usual, their convolutions were devoid of ribbings or humps. But in the next stratum, the same shells were found with a hump on each convolution; and in the third, the same shells had three humps; thus adapting their dwellings to their new circumstances.

Speaking of the fine thread-like lines or streaks on some shells, Lord Brougham and Sir Charles Bell remark :—" We should be inclined to say that the earthy matter crystallises, were it not that the striated or fibrous appearance differs in the direction of the fibres in each successive stratum, each layer having the striæ composing it parallel to one another, but directed obliquely to those of the layer previously formed, and the shell exhibiting a strong texture arranged upon well-known mechanical principles."

Instances may, however, be pointed out in which animal matter is specially blended with the earthy particles for the sake of strength, and here the carbonate of lime has more or less of a crystalline arrangement. The minute crystals are rhomb-like, having equal sides, the opposite side parallel, and the angles unequal; or else like prisms, whose bases or ends are any similar plane figures, and whose sides are parallelograms. In the latter case the fibres are short, and the prisms are generally hexagonal; but in the former, they are composed of three distinct layers, each of which consists of very thin plates, marked by oblique lines, which show the direction of the crystalline fibres, so arranged as to give strength to the shell, on the very principle latterly applied to the building of ships. When, too, the form of the crystals is prismatic, the fibres are short, and the prisms generally hexagonal.

THE CYPRŒA.

"My inquiries," says Dr. Carpenter, "so far as they have yet proceeded, tend to establish this position, that where a recognisable and constant diversity presents itself in the elementary structure of the shell among different groups, that diversity affords characters which are to a very high degree indicative of the natural affinities of these groups. It is not always that peculiarities sufficiently distinct present themselves, even between what are zoologically regarded as distinct families; but where a marked diversity does exist, I believe that it will always be indicative of the affinities of the animal. Thus the conformity in structure between all the shells of one natural family is usually so close that any strongly marked difference in a particular genus would make one hesitate in admitting it into the group." Further inquiries will doubtless lead to the discovery of more minute specific differences.

According to the same high authority, if a small portion be broken away from the thin margin of the shell of any species of *Pinna*, and it be placed without any preparation under a low magnifying power, it presents on each of its surfaces, when viewed by transmitted light, very much the appearance of a honeycomb; whilst, at the broken edge, it exhibits an appearance which is evidently fibrous to the eye, but when examined under the microscope with reflected light, resembles that of an assemblage of basaltic columns. The shell is thus seen to be composed of a vast number of prisms, having, for the most part, a tolerably regular hexagonal shape and nearly uniform size. These are arranged perpendicularly to the surface of each lamina, so that its thickness is formed by their length, and its two surfaces by their extremities. The substance forming these prisms is generally transparent, but here and there is found a dark spot, arising from the fact that the prisms are found to be composed of a series of cells laid one on the top of the other.

Many a mollusc can not only construct, and thus surprisingly adapt, but adorn its habitation. The skin of the little artist is full of pores; these contain colouring fluids, which, penetrating the calcareous substance before it is hardened, form the various tints with which shells are often gaily and even brilliantly adorned. So far from these colouring pores occurring at random, they are arranged as regularly as the spots of a leopard or the stripes of a tiger; and, still more wonderful to tell, each mollusc paints his own dwelling exactly according with the pattern observed by every one of his species.

COWRIES.

The genus *Cypræa* was early dedicated to Venus, the goddess of Cyprus. One kind is collected by negro women of the Indian Islands, and thence sent to Bengal, Siam, and Africa, where it is used by the natives as a substitute for money.

The small shell, called the Cowry, used as small coin in many parts of Southern Asia, on the coast of Guinea, in Africa, and principally in the Philippine Islands, is a species of Cypræa.†

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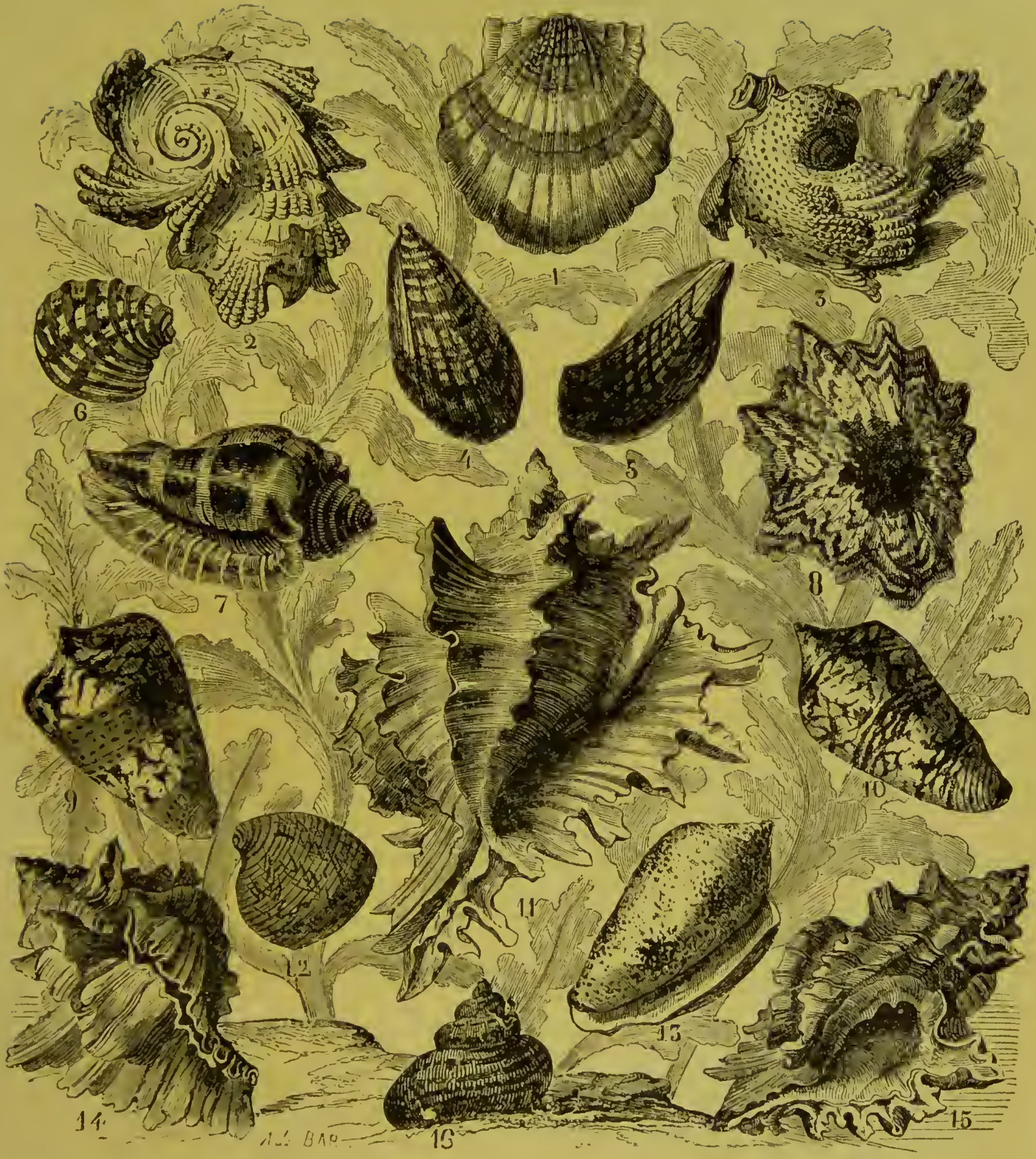
† Cypræa moneta.



1. Pecten. 2. Cochlea lunaris. 3. Interior of the same. 4. Mytulus. 5. Interior of the same. 6. Chama. 7. Cassis rubra. 8. Striated Lepas. 9. Cucullaris voluta. 10. Cucullaris. 11. Purpura foliata. 12. Chama. 13. Sanded Volute. 14. Purpura crispata. 15. Interior of the same. 16. Cochlea lunaris fusca. After the classification of Requenfous.

THE TOP-SHELLS.

The small gray Top-Shell, of an ash colour, with gray markings, is well known. It is sometimes called the dog-periwinkle,* and is very abundant among the sea-weeds near the shore.

Some of the specimens of the muddy-red trochus † are very pretty shells, sometimes measuring an inch from the base to the pointed summit, and marked with diverse colours. A beautiful creature is the mollusc inhabiting this shell.

But the most beautiful of our native species is the large top-shell, ‡ which is sometimes painted with the most vivid hues. Not inferior in brilliance to the shell itself is the animal which constructs it.

A trochus § accumulates during the formation of its shell different foreign substances, and is often found covered with stones, coral, small shells, and fragments of shells (see page 286); and hence it has obtained the name of the *carrier*. How this collection has been made is not yet ascertained; but probably some very tenacious matter is combined with its calcareous secretions, which cause whatever comes in contact with it before it is hardened to adhere to its surface.

The tongue of some of these creatures is, in fact, an extremely delicate ribbon, of a transparent substance, on which teeth are placed, of a texture glassy and brilliant. These teeth are arranged in three rows; the middle ones being three-pointed, while in the two other rows there is the alternation of a three-pointed tooth with a larger one, which has a somewhat boat-like appearance. As the teeth project from the surface of the tongue in hooked curves, and all point in the same direction, the tongue acts like a rasp, the projecting teeth abrading the surface of the plants, just as the horny papillæ of the lion's tongue act on the flesh of the stag, or any other of his victims. The periwinkle, too, has a similar structure.

AGGLUTINATED SHELL.

THE WHELK.‖

The Whelk has a mouth which may be described as a flexible proboscis, movable in various directions, and capable of being completely retracted. The tongue is supported by two cartilaginous slips, the extremities of which are formed into a sort of lip; these lips can be opened and closed, and the cartilages can be moved upon each other. The tongue is armed with hard spines, rendering it a pointed file; and when it is applied by the proboscis to any shell the animal desires to drill, the supporting cartilages alternately depress and elevate the spines, which rasp away, and soon penetrating the shell, leave its tenant a banquet to the whelk. The shell of this creature is one very frequently found on our shores. Another kind of whelk, almost equally common, is the stone or dog-whelk,¶ which has yellow zones round it, and is interesting as having been one of the shells which furnished the valuable Tyrian dye of which we read in Scripture and in ancient history.

THE PHOLAS.**

Of the genus so called there are several British species, which are often found embedded in limestone or sandstone rock (see page 286), and hollow out for themselves dwellings in it, though occasionally they content themselves with houses of clay. How so frail a shell, which is as thin as paper, and as brittle as glass, is able to work its way through hard stone, has long been one of the puzzles of naturalists.

THE SHIP-WORM.††

The Teredo obtains a dwelling-place by means no less remarkable than the pholas. It perforates wood, even the soundest and hardest oak, and lives securely in the cavity it forms. Nor let it be supposed that these creatures only do extensive mischief to ships, piers, and submarine wood buildings; for they render important service also. But for them the rivers in tropical regions would be choked up by accumulated driftwood, while fertile banks would be changed into morasses; and the navigation of the sea would be interrupted by the floating timber.

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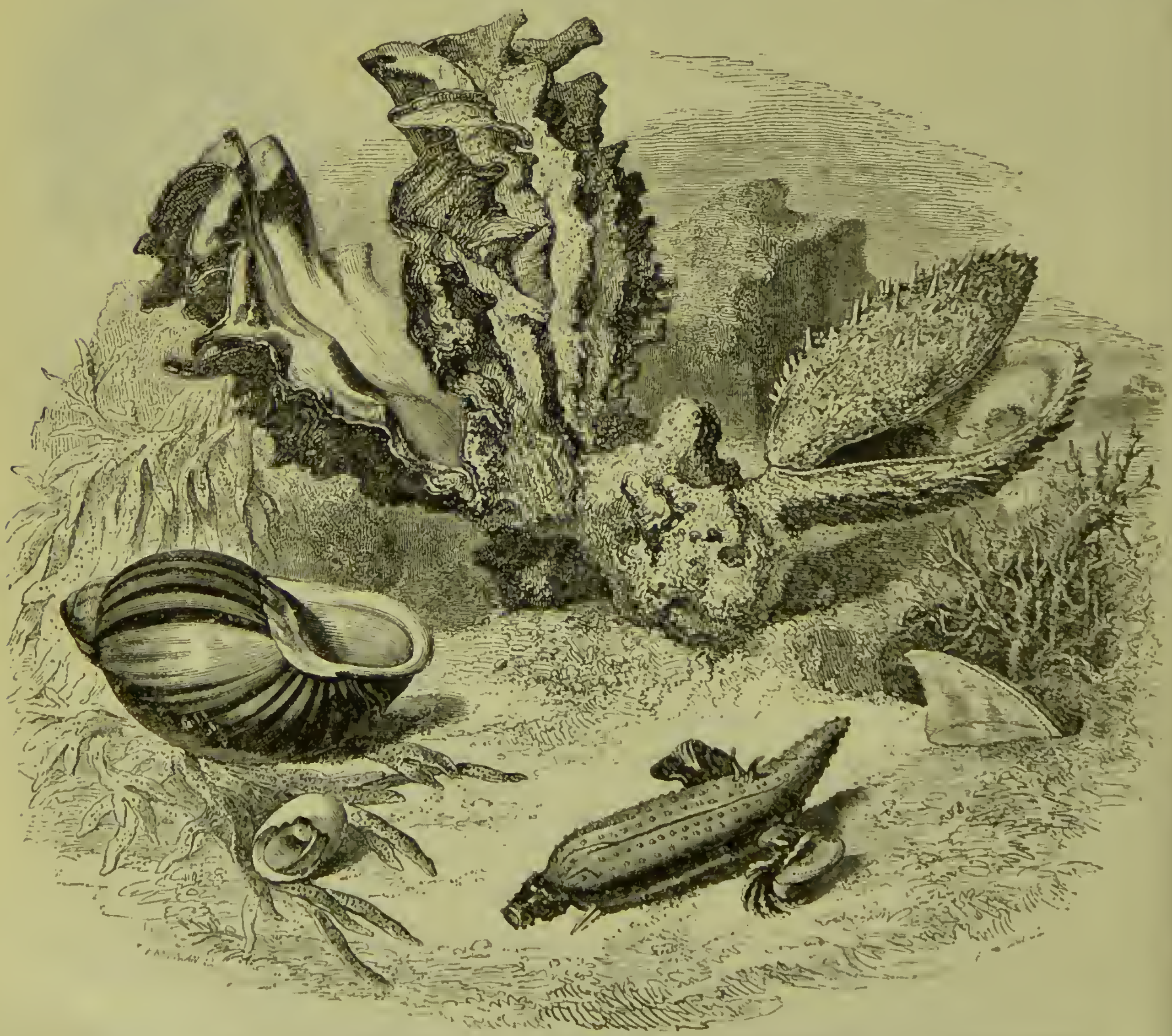
* Trochus cinerarius. † T. ziziphynus. ‡ T. majus. § T. agglutinans. ‖ Buccinum undatum. ¶ B. lapillus. ** Pholas candida. †† Teredo navalis.

THE SHIP-WORM.

THE CARINARIA.

The shells of a remarkable group of mollusca, to which this name has been given, were formerly known to collectors as Venus's Slipper and the Glass Nautilus. The body of the animal is sub-cylindrical, elongated, transparent, dotted with elevated points, prolonged posteriorly, and furnished towards the upper part of its posterior extremity with a sort of fin, which performs the part of a rudder. A reddish, thin, compressed, semicircular fin, beautifully reticulated, and furnished with a sort of sucker, rises from the belly, nearly opposite to the point on the back occupied by the shell; and with the aid of this fin it floats along. The head is capable of contraction within the body, and is provided with a sort of retractile proboscis.

Other varieties are remarkable in a different way. Of one, Dr. Johnstone says:—"When shrunk


SNAIL SHELL. EGG, SHOWING THE SNAIL IN ITS EARLIEST STATE. OSTREA HYOTIS AND SPONDYLUS DELISSERTI, NATURALLY UNITED. CARINAIRE OF LAMARCK. GLASSY CARINARIA.

within its shell, you might well deem any animal that could hide itself there, all too small and weak to carry about a burden larger and heavier than itself, and that safety might be here advantageously exchanged for relief from so much heaviness of armour, and from such an impediment to every journey. There is in my cabinet a fine specimen of *Cassis tuberosa*, which measures fully ten inches in length, and upwards of eight in breadth; another, of *Strombus gigas*, is nearly one foot in length;" and other huge shells may be mentioned, as those which form fonts in one of the churches of Paris. "Yet," continues this distinguished naturalist, "though the weight of the former is four pounds two ounces, and that of the latter is four pounds nine ounces, the mollusc creeps under this load with apparent ease. Nor are you much surprised when you see it actually in motion, for the seeming disproportion between the contained animal and containing shell has disappeared.

"On issuing from his shell, like an Eastern genii freed from his exorcism, the animal has grown visibly—has assumed a portlier size and more pedestrious figure. The body has suddenly become tumid and elastic, the skin and exterior organs stretched and displayed; the foot has grown in length and in breadth, and, with additional firmness, it has acquired the capability of being directed, bent, and modified in shape to a considerable degree, as the surface of the road traversed may require." For other examples of shelled creatures, we can now only refer to a separate page of engravings.

A highly interesting family of mollusca remains to be considered, distinguished above all the preceding orders by a much more elaborate organisation, and a far wider range of faculties. Their name * is derived from the position of certain organs of progressive motion, which are situated on the head, and surround the opening of the mouth. These tentacula, or feet, or arms, are long, slender, flexible processes, exceedingly irritable and contractile in every part, and provided with numerous muscles, which are capable of moving and twisting them in all directions with extraordinary quickness and precision. In many species, too, they are not only highly muscular, but perfectly flexible; and are thus well adapted to twine easily round an object of any shape, and to grasp it with prodigious force. They are also furnished with numerous suckers all along their inner sides.

The sucker of the arms of a Cephalopod, sometimes of gigantic size, is a self-acting cupping-glass, or air-pump, of most precise and beautiful construction. It consists of an adhesive disc, with a thick, fleshy circumference, provided with a number of radii, converging to surround the circular mouth of an inner cavity. At the bottom of this is a movable muscular piston, which, when the sucker is not in action, appears level with the circular aperture; but which, when the disc is closely applied, is strongly drawn back, thus taking a firm hold of any desirable object. When the animal releases its grasp, it relaxes the muscles of the piston, which retiring, fills the vacuum, and the adhesion ceases.

CEPHALOPOD.

THE CUTTLE-FISH.†

The engraving we give of this creature will convey a general idea of the form of a naked cephalopod; but this varies in the different genera. In this instance the soft parts are supported by a firm, calcareous bone, the well-known cuttle-bone of the shops; and in all the naked cephalopods, not including *Ocythoe* now existing, it would appear that some rudiment, at least, of a bony, horny, or cartilaginous support is to be found.

When a cachalot or a grampus gives chase to a Cuttle-Fish, to escape by speed is out of the question, and concealment alone is practicable. No sooner, therefore, do the quick eyes of the pursued behold an advancing enemy, than it sinks downwards, and then throws out from a vessel with which it is provided a stream of ink, which entirely conceals it from the gaze of the foe. It is some time before the opaque and murky cloud is dissipated; if the danger is past, the cuttle-fish actively seeks its prey; if not, it pours out another flood of ink, and remains in quietude till the peril has gone.

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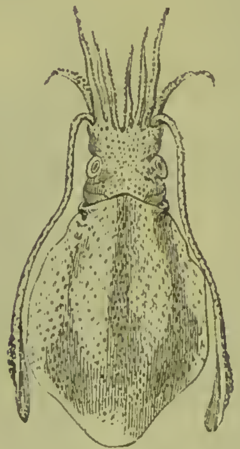
* Cephalopoda.

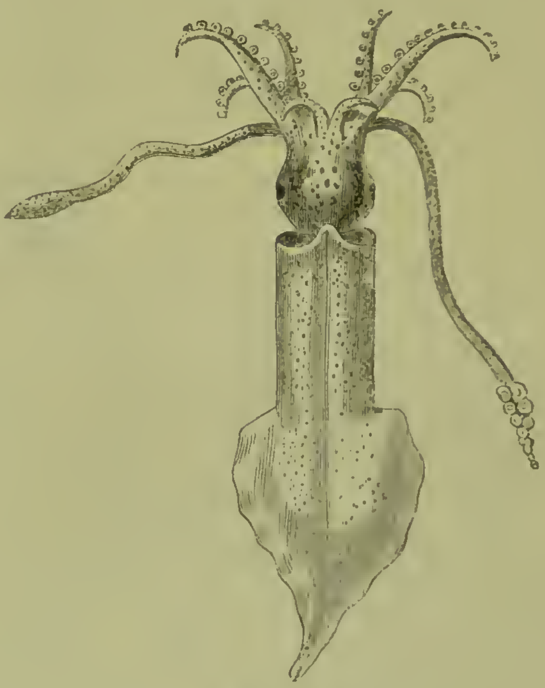
† Sepia officinalis.

THE CALAMARY.*

This animal is a member of a genus† which belongs to a varied tribe.‡ It has a firm, fleshy, cylindrical, elongated body, towards its posterior extremity flanked by two triangular fins, which run to the tail. The locomotive apparatus is formed of two oblong margined pits placed at the base of the funnel, and of corresponding linear prominent crests on the inner margin of the sleeve. The eyes are covered by an epidermic expansion, pierced with a small opening. The eight ordinary arms are stout, and rather short, slightly webbed together at their bases; on their inner side they are furnished with two rows of oblique suckers, with eccentric rings, of which the open horny hoops are armed on their broader side with teeth. The tentacular arms are long, stoutly pedunculated, and furnished at their lanceolate extremity with suckers, large centrally, small towards their tips, and ranked in fours.



THE CUTTLE-FISH.



THE CALAMARY.

THE POULPE.§

Such is the modern name of a singular creature. In ancient times it was called "many-feet." Its feet, appended to the head, are not intended only to aid it in walking or in swimming, by the contraction of the connecting membrane; they are used also for the seizure of prey. So powerfully armed, the Poulpe becomes one of the most destructive inhabitants of the sea; for neither superior strength, nor activity, nor even defensive armour is sufficient to save its victims from the ruthless ferocity of such a foe. A hundred and twenty pair of suckers, more perfect and efficacious than the cupping glasses of art, crowd the lower surface of every one of the eight flexible arms. If the poulpe only reach its prey, it is enough; if once a few of these tenacious suckers get firm hold, the swiftness of the fish is unavailing, as it is soon trammelled on all sides by the firmly-holding arms, and dragged to the mouth of its destroyer.

An adventure with one of these creatures is too remarkable to be omitted. Mr. Beale was searching for shells upon the rocks of the Bonin Islands, a series of groups in the North Pacific, when he was greatly astonished on seeing at his feet a most extraordinary looking animal, crawling towards the surf, which it had only just left. It was creeping on its eight legs, which, being of a soft and flexible nature, bent considerably under the weight of its body, so that it only rose a small distance from the rocks. Mr. Beale endeavoured to stop it by pressing on one of its legs with his foot; but, although he used considerable force for that purpose, its strength was so great that it several times liberated its member, in spite of all the efforts he could employ on the wet and slippery rocks. He then laid hold of one of its arms with his hand, and held it firmly, so that the limb appeared as if, by these united efforts, it would be torn asunder. Mr. Beale then gave it a powerful jerk, wishing to disengage it from the rocks to which it clung so forcibly. This effort the creature effectually resisted; it lifted its head, with its large, projecting eyes, and, loosing its hold of the rocks, suddenly sprang on Mr. Beale's arm, which he had previously bared to the shoulder, for the purpose of thrusting it into the holes of rocks after shells, and clung to it with great power, endeavouring to get its beak, which Mr. Beale could now see between the roots of its arms, in a position to bite. Mr. Beale declares that a sensation of horror crept over his whole frame when he found that this monstrous animal had fixed itself so firmly on his arm. Its cold, slimy grasp became extremely sickening, and he loudly called to the captain of the vessel, who was also searching for shells at some distance, to come and release him from his disgusting assailant. The captain quickly came, and, taking Mr. Beale down to the boat, during which time the latter was employed in keeping the beak of the creature away from his hand, quickly released him, but only by destroying his tormentor with the boat-knife, when he disengaged it by portions at a time. This creature must have measured across its expanded arms about four feet, whilst its body did not exceed in size a large clenched hand.

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* Loligo vulgaris. † Loligo. ‡ Teuthidæ. § Octopus vulgaris.

Other genera of these mollusca are, like the sepiæ, provided with tentacula attached to the head, and differ exceedingly in size, some being very large, but a great number are very minute, and even microscopic. The shells of these animals are often found to contain *partitions*, dividing them into a number of chambers.

M. Flourens has recently communicated to the French Academy an account of an enormous cephalopod, seen by Lieutenant Bowyer, about forty leagues north of Teneriffe. It appeared to be from thirty-one to forty-six feet in length, having a soft, gelatinous body, of a reddish colour, and shaped like an immense horn; the widest part being about two yards in diameter, and surrounded by very strong arms, or tentacles. It was repeatedly shot at, and the balls passed through it without doing much harm.

On one occasion, however, a quantity of blood and froth, of a musky colour, flowed from the wound. After being harpooned several times, the body of the creature was surrounded by a rope, and efforts were made to haul it on board. Unfortunately, the rope cut the soft flesh, and only the posterior part was secured. The sailors wished to pursue the remainder of the monster in a boat, but Lieutenant Bowyer was afraid that its long tentacles, armed with suckers, might cause it to swamp them, and it was therefore permitted to escape.

M. Moquin Tandon added some further particulars, and exhibited a sketch of the cephalopod. He observed that the fishermen of the Canaries often met with similar creatures, one or even two yards in length; but they were afraid to attack them. M. Milne Edwards mentioned numerous instances of the appearance of monster cephalopods. Rang had seen one with a body as big as a hogshead; and Steenstrup examined the body of another, which was thrown on the shores of Jutland, and which he denominated *Archileuthis dux*. M. Milne Edwards considered that there was reason to believe that these large cephalopods were not all of the same species; and he had no doubt that many kinds which existed in the depths of the sea far exceeded the bulk of any known invertebrate animal.

THE PEARLY NAUTILUS.*

From the section of the shell which appears in the engraving, it will be seen to be chambered, and divided by numerous regular partitions into distinct compartments, the last or largest of which only incloses the body of the Nautilus; and a tube, partly membranous and partly composed of shelly matter, traverses all these compartments.

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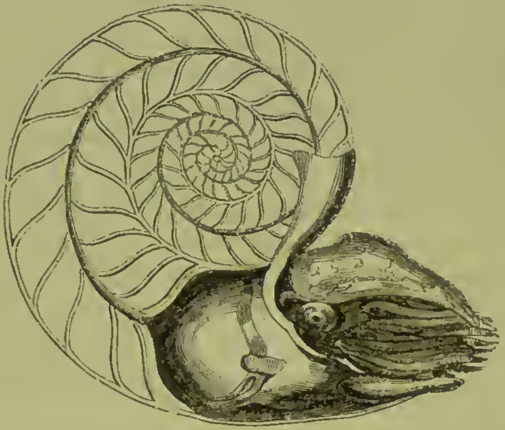
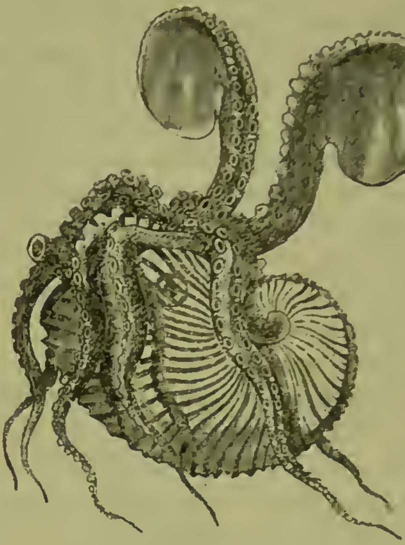
* Nautilus Pompilius.

These chambers, as Hooke suggested, naturally contain air, and, being thus filled with a fluid more buoyant than water, enable the nautilus to float, notwithstanding the density of its shell; but when it wishes to sink, it forces water through the tube, and thus effects its purpose.



SECTION OF THE CHAMBERED SHELL OF THE PEARLY NAUTILUS.



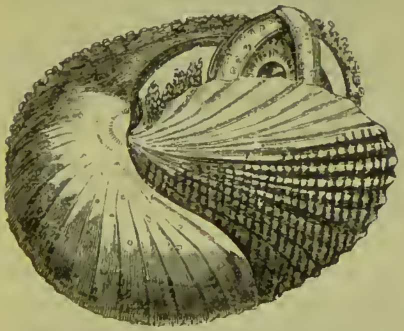
THE FABLED ARGONAUT.

THE PAPER NAUTILUS.*

A POET says :—

> "The native pilot of this little bark
> Put out a tier of oars on either side,
> Spread to the wafting breeze a twofold sail,
> And mounted up and glided down the billow."

But it has been proved, by careful examination, that the animal has no such sails; it appears as in the engraving when retracted in its shell, and throws forward at pleasure its singularly-formed body, of which one eye may be perceived.



THE PAPER NAUTILUS.

FORAMINIFERA.

ALONG the margins of the tide, as well as at different levels of the sandy beach, and in the crevices of rock pools, may frequently be seen small patches of drifted sand and shells. Some of these shells are of microscopic size. They have obtained the name just given, from those of most of the genera being perforated all over with openings, so that the fleshy bodies may keep up their connection with the water. They vary in size from a mere point to an inch and a half in diameter. The outer surface is generally smooth, and marked with fine, undulating lines.

On splitting a shell transversely, it is found to consist of several coils, divided into a great many cells, or chambers, by minute partitions. These are open to the examination of all. Some are of very strange shapes, and others structures of great elegance. Some have a shell resembling either a modern flask or an ancient amphora or bottle so perfectly that it might be supposed the artist had taken one for his model. While these have the oral extremity of the flask produced into an external tubular neck, others have an internal tube, rising from the upper extremity of the shell, and prolonged downwards into its cavity, as if the neck, instead of being extended from the body, were introverted. Others are of a more complex structure, consisting of a number of distinct chambers, arranged one after another, like those of a nautilus, communicating with each other by pores, and variously disposed, either in a spiral order or in straight or curved lines. The animals of these shells have been found in a living state. On careful examination, it has been seen that they are without organs of locomotion, or even respiration, being composed of a succession of joints or lobes, which go on increasing successively, and enveloping each other. The soft parts of the animal are visible externally when a new joint is produced which has not completed the formation of its shelly chamber.

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* Argonauta argo.

These minute shells, called nummulites, from their resemblance to coins, specimens of which may be seen in all our museums, abound in the blue clay at Bracklesham and Slubbington, and the calcareous sandstone of Emsworth and Bognor, in Sussex. They abound in the *calcaire grossier*, so commonly employed as a building-stone in Paris, that it may be said the capital of France is almost constructed of these minute and complex shells. They constitute immense beds in the Alps and the Pyrenees.

One form of the Foraminifera abounds in the stone of which the Great Pyramid was built; and there can be no doubt that the lentil-shaped pieces which Strabo found among the *débris* of the stone quarry when he visited it, and which were explained to him as being the petrified provisions of the workmen employed by the Pharaohs, were really some variety of nummulite. This creature was sedentary in its habits; one side of it is often found moulded to the inequalities of the sea-bed on which it grew, and thus presenting the appearance of the half-shelled lentil, which struck the ancient geographer. The nummulite limestone extends through a large portion of Northern Africa and Southern Asia, including Arabia.

SEA-STARS, ECHINODERMS, &c.

THE SEA-STAR.*

This creature appears in great variety. The ancient naturalists asserted that Sea-stars were so hot that they could consume all they touched; and Aldrovandus and Albertus declared that whatever they were brought into contact with they cooked; but, as usual, they advanced no proof.

Others have affirmed that the sea-stars sting and blister the fingers when touched, a notion which probably led to their receiving the strange name of "Devil's Fingers." As Dr. Drummond was drying some in his garden, at Bangor, in the county of Down, he heard some children on the other side of the hedge exclaim, "What is the gentleman ganging to do with the bad man's hands? Is he ganging to eat the bad man's hands, do you think?"

Now, such a superstition is not surprising, when no less a person than Hippocrates, and some of his successors, considered sea-stars to be a cure for hysteria and epilepsy, when taken in a decoction of brassica and sweet wine. But it would be difficult, if not impossible, to establish the stinging power of these creatures. Certain it is, that Professor E. Forbes declares that he has handled thousands of them without suffering the slightest irritation of the skin; and in this experience that of every naturalist we have known or heard of fully coincides.

On taking up a sea-star, a glance at its structure is desirable. Like many other creatures, it possesses no brain or nervous centre, but merely a nervous cord, which encircles the mouth, and thence radiates into the five points or rays; each of these, too, even in its simplicity, is exquisitely complex. The skeleton, which is of a calcareous nature, is composed not merely of scores, but hundreds of minute portions, exactly fitted to each other in a symmetrical pattern. Harvey says it resembles an elaborate piece of crochet-work; but there is no comparison between the products of finite and of Infinite power. If a sea-star be dropped into fresh water it will act as a poison, and the creature will instantly die. It may then lie there for a little time, be dipped for a moment in boiling water, and afterwards dried, as it may be speedily in the sunshine, or in a current of air. If it be placed in an ant-hill, its busy inmates will soon expose to view, for the cabinet of the possessor, a perfect skeleton.

The sea-star appears to be a helpless animal. No power would seem less likely for it to have than that of motion. One might think it doomed to live and die in abject solitude. But let us guard against premature judgments. Buffon looked on a sloth, as it lay on the ground, pronounced it to be an ill-shapen creature, passing its days in misery, and even affirmed that it was "a blot on the fair face of creation." He saw the animal, however, in circumstances where it was not designed to be, like a fish out of water, with no opportunity for the play of its powers, and therefore in a state of discomfort and restlessness. Had the naturalist been wandering amidst the wilds of Guiana, and had a sloth crossed his path to climb a tree at its side, then would he have beheld it make the ascent with a celerity and pleasure for which, by its structure, it is especially prepared.

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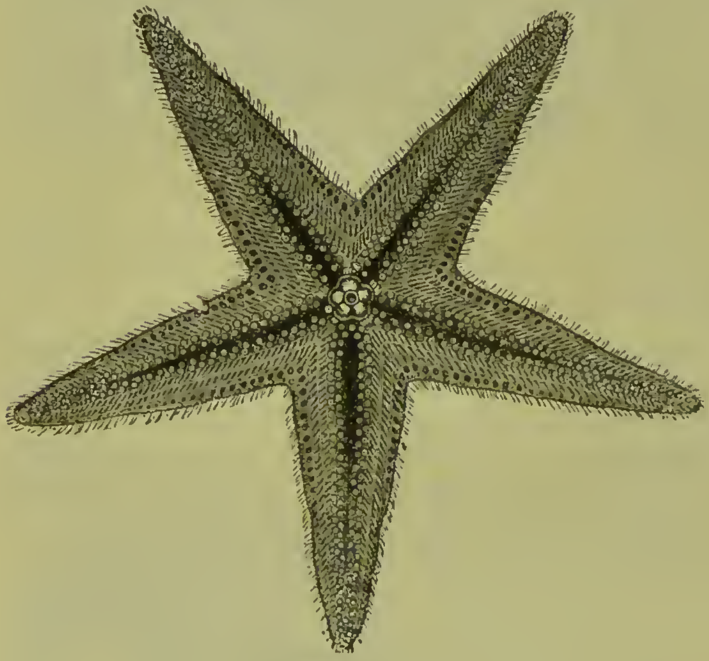
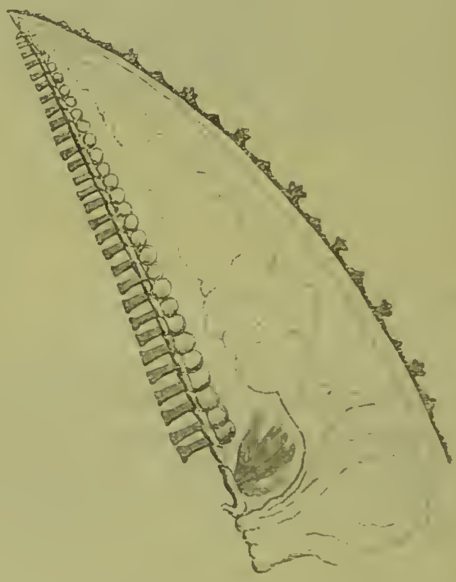
* Asterias.

And so, if the sea-star, which has been lying motionless and supine on the sandy beach, be taken up and placed in a transparent vessel of sea-water, or even in one of the little pools left among the rocks by the receding tide, the result will startle the eye unused to such a spectacle. There, on a bed of sea-weed, lies the sea-star on its back, apparently as helpless as the little anemone that may be its companion. But, look for a few seconds, and little tubercles issue from the under sides of each of the rays, where they are longitudinally arranged on the two edges. At the creature's pleasure they lie close to the ray, and equally so they are filled with a fluid with which it is provided, causing the tubercles to lengthen themselves into sucker-like feet, which wave backwards and forwards, as if the creature were determining the course it would take. And now, bending down in the direction nearest the rock, it fastens the first suckers that reach it, that, by contraction, it may bring down a portion of the body; this allows, of course, other feet to touch the bottom, to which they adhere; and so the sea-star proceeds, until, by the united action of its suckers, it is restored to its rightful position.



UNDER SIDE OF SEA-STAR.



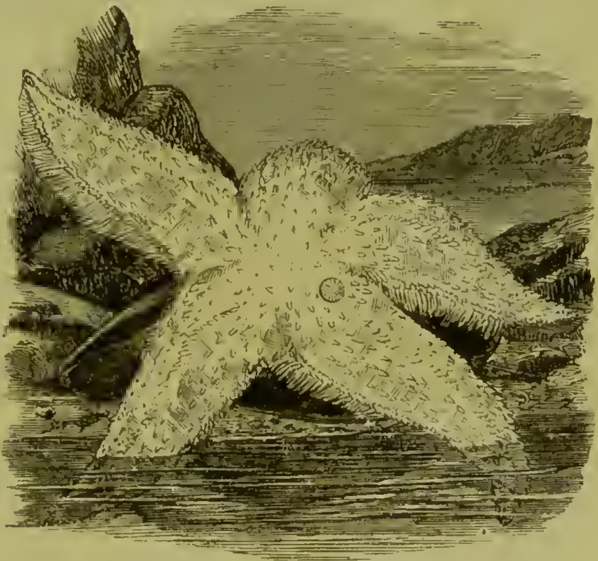
LEG OF A SEA-STAR.

It is a pleasant sight when one of these creatures is placed in a glass vessel containing sea-water, and its various movements are attentively watched. Then it will be seen that it has, in fact, several hundreds of these sucker-like legs, each one a perfect tube, which, when the animal wishes, becomes filled and extended, while the fluid is as readily withdrawn into the vesicles of the body. We have heard of Argus with his hundred eyes, and of Briareus with his hundred hands, but we are not told that each eye could find a separate object to contemplate, or that each hand could be employed in some distinct manipulation. It seems, however, as if each leg of this animal had an independent action, being capable of darting out in various directions, as if, like a living lever, it were seeking the best fulcrum, in order to render its highest service to the movement that is now taking place.

In the possession of a sea-star, it is very easy to witness its voracity; for only let a morsel of fish or of a mollusc be placed within reach, and thither it will go, clasping the prey as soon as it is gained with its rays, and absorbing it into the stomach, to which there is an opening on the under side. In the eagerness it thus manifests it fulfils its appointed destiny. It is one of the scavengers of Nature, ordinarily working silently in the deep waters, devouring, from tide to tide, the ever-accumulating matter which, left undisturbed, would destroy every species of life. So strong is the predilection of these creatures for garbage, that the angler has frequently wished they would suspend their vocation, since scarcely has the baited hook sank to the bottom of the water than he has felt " a bite," only to find that he has caught a sea-star—a luckless beginning, perhaps, of a series of disappointments the same in kind.

Might we suggest a banquet for a party of sea-stars, it should be the contents of an oyster barrel, without any specification of the spot where it was filled. The large and coarse oysters of Liverpool and Bristol would doubtless be as much enjoyed as the most sleek and delicate " Miltons" or " Colchesters." " But how," it may be asked, " can their shells be opened? In what way can the resistance of the adductor muscles be overcome? Where is the oyster-knife of the sea-star for the banquet you propose?"

And assuredly it is not, as Appian imagined, in one of its rays. The supposition of the ancients that the sea-star, like a besieging force, took up a position that would secure the best point of attack, and, seizing the moment in which the oyster unwarily opened, however slightly, the valves of his shell, thrust in a ray, gradually insinuated its whole body, and so devoured the assailed—a notion which was also entertained by Bishop Spratt—has proved to be utterly fabulous. For, having reached an oyster by its locomotive power, and placed itself on its prey, it pours out a paralysing fluid, and instils it between the shells; as soon as they are open, the stomach is thrust in, and the captive is devoured, however long his house may have been his castle. Such is the fact established by the actual observations of M. Deslongchamps.


A SEA-STAR DEVOURING A MOLLUSC.

A sea-star was found clinging round a *mactra*, which was pierced with a hole, through which the creature had inserted a sucker, and this aperture was attributed to the invader. But we have no proof that this animal possesses any boring power. The probability is, therefore, as Professor Forbes suggests, that the hole was pierced by one of those marine worms we have already contemplated, and that the sea-star, in this instance, was merely " sounding with its sucker the prospect of a meal."

THE FRAGILE SEA-STAR.*

" NEVER having seen a *Luidia frangilissima*," says Professor Forbes, " and, till now, unconscious of its suicidal powers, I spread it out on a rowing bench, the better to admire its form and colour. On attempting to remove it for preservation, to my horror and disappointment, I found only an assemblage of rejected members. My conservative endeavours were all neutralised by its destructive exertions; and it is now badly represented in my cabinet by an armless disc and a discless arm.

" Next time I went to dredge on the same spot," adds the Professor, " determined not to be cheated out of a specimen in such a way a second time, I brought with me a bucket of cold fresh water, to which star-fishes have a great antipathy. As I expected, a luidia came up in the dredge, a most gorgeous specimen. As it does not generally break up before it is raised above the surface of the sea, cautiously and anxiously I sunk my bucket to a level with the dredge's mouth, and proceeded, in the most gentle manner, to introduce luidia to the purer element. Whether the cold air was too much for him, or the sight of the bucket too terrific, I know not, but in a moment he proceeded to dissolve his corporation, and at every mesh of the dredge its fragments were seen escaping. In despair, I grasped at the largest, and brought up the extremity of an arm, with its terminating eye, the spinous eyelid of which opened and closed with something exceedingly like a wink of derision."

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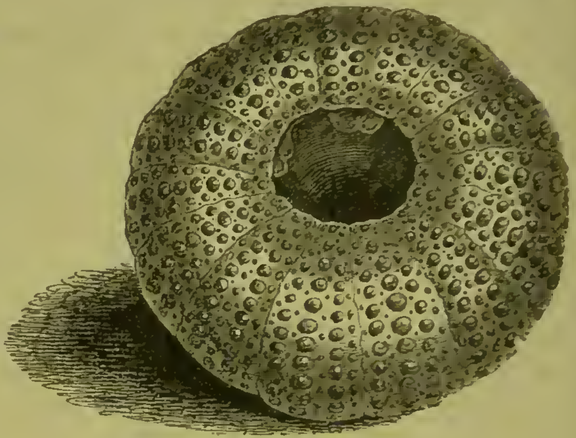
* Luidia frangilissima.

THE SEA-URCHIN.*

The engraving will represent to any one used to the sea-shore a shell which may often be seen rolling over the sand as the wind stirs the sea-weeds. It is sometimes called the Sea-Egg.

Now, here is a question : as the animal grows, how is its stony mansion to be enlarged? Were the shell of one piece, growth would be impossible ; the Divine Architect has therefore built up its house of a multitude of six-sided pieces, all fitted together with astonishing accuracy. Covering the entire surface of the shell, and passing between the margins of all these pieces, is living membrane, which secretes and deposits calcareous matter, in an equal ratio, along the edge of each one of them.


SHELL OF THE SEA-URCHIN.

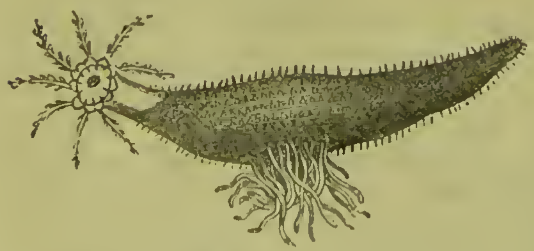
The dome, too, is arrayed with spines of greater or less diameter, each one being indented at its lower end, that it may fit exactly the little protuberance to which it is attached by a nicely-adjusted ligament, and prove, at the pleasure of the animal, a leg, on which it may roll itself to another spine, becoming a leg in its turn, thus removing the dwelling with its inhabitant from spot to spot.

Still further: scattered over the skin are a multitude of little processes. Accurately examined, each one is a pair of calcareous forceps, mounted on a stem, opening and shutting its blades, so long as the animal lives, with considerable force. Their purpose has been long an enigma to naturalists. But they are regarded by some, with great probability, too, as the creature's police ; arresting the troubler, whatever it may be, and ejecting it from the body on which it has intruded.

Nor have we yet exhausted the wonders of this structure. Capture one of these creatures, and you will have in it much to observe. If placed in a vessel of water, you will find it actually scales the sides, and hangs in safety from the perpendicular surface. If, then, we look attentively, we shall find rows of orifices into the interior, passing from pole to pole, running in pairs, each having five ; and a tube terminating in a powerful sucker, passing through each opening. Pushing these suckers beyond its longest spines, and bending in all directions, they enable the urchin to make his ascent, even up the most precipitous sides of the rock, and at his pleasure to anchor himself to it.

THE SEA-CUCUMBER.†

Of this creature there are several species. Their name is very expressive of their form in a contracted state, when the body shrinks up into an oblong mass, slightly tapering to each end, and rough with wrinkles and with the rows of sucking feet, which it has in common with the sea-stars and urchins.


THE SEA-CUCUMBER.

THE SPONGE.‡

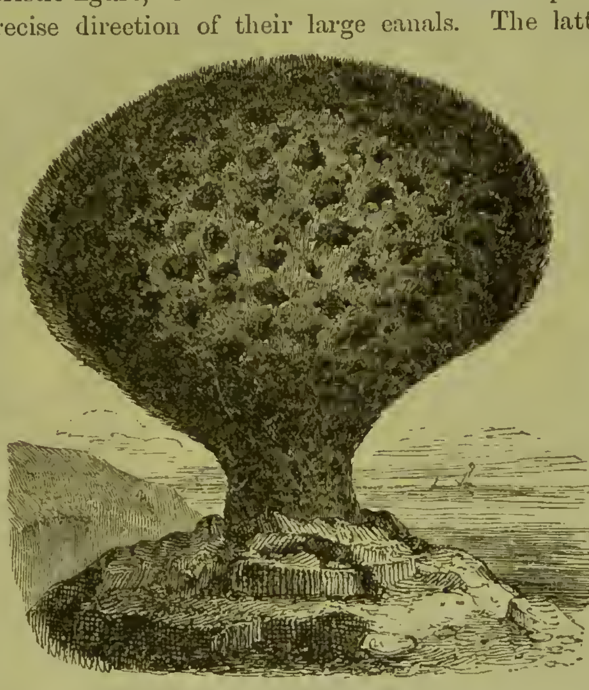
In this familiar object we may observe circular holes, which lead into canals permeating the whole substance. These canals, when the Sponge is living, are filled with a fluid resembling the white of an egg, varying in quantity according to the species. When a drop of it is examined under a microscope, it appears entirely composed of very minute transparent grains, either spherical or ovate, nearly all of the same size, with some moisture. The structure with which we are familiar is merely the framework, or under skeleton, of the sponge ; the characters presented by it greatly differing in the various species, which are extremely numerous.

* Echinus sphæra. † Holothuria. ‡ Spongiadæ.

In the common sponge, the fibres are elastic and horny in their texture, and when highly magnified, appear to be tubular; but in other species, the framework consists of a firm, inflexible tissue, of intercrossing filaments, also tubular; and the living gelatine covering the entire surface, with all the channels, exhibits bands of a more cartilaginous consistency than ordinary, and is also more or less replete with minute crystallised spicula. These are usually simple, needle-like points, but sometimes they are three or four pointed.

Multitudes of spicula are placed longitudinally around the internal canals of the sponge, of which they form the walls: they generally consist of silica or flint, and, minute as they are, are capable of scratching glass. A small portion of silica has been detected in the ashes of the common sponge, as one of the constituents of its elastic fibres. It appears, moreover, that the proportion of silica increases according to the firmness of the fibres of the sponge, and that where these are elastic, animal matter predominates. The forms of the spicula are constant in every species, and consequently become tests in their identification. In some species the spicula are calcareous; but whether calcareous or siliceous, they assume the forms which the crystals of lime and silica present under ordinary circumstances.

Though every species of sponge has its characteristic figure, no two individuals of the same species agree in external form, or in the number and precise direction of their large canals. The latter multiply as the animal increases, and circumstances influence development in one part more than another. Still, no species puts on the appearance of another. The Crumb-of-Bread Sponge is always well described by the name it bears, not only as it appears to the eye, but as it feels to the touch. When exposed to an unusually great agitation of the sea, sponges have a structure proportionately dense and compact. In the intertropical latitudes, they display gigantic forms, and strange or grotesque figures; in the colder latitudes they are smaller, and of a firmer and more rigid texture.



SPONGE.

They often grow in places which the returning tide leaves dry; but their congenial abode is in sheltered and tranquil spots, in caves and fissures of rocks, where the water, never ruffled by the storm, is "deeply, darkly, beautifully blue." Fixed, plant-like, to the rock, they festoon the deep sea-caves; they line the walls of submarine grottoes, and hang as singularly-shaped ornaments from the roof; some like inverted goblets, aptly termed "Neptune's drinking cups;" some like fans, some like globes, and others like intertwined branches of uncouth growth. Yet, the cup sponges never approach such as are branched, nor those that resemble a tuft of moss, or any other form. The original figure of a sponge, so to speak, remains utterly unchanged.

Dr. Grant put a small branch of a sponge, with some sea-water, into a watch-glass, under the microscope, and on reflecting the light of a candle through the fluid, he perceived that there was some inward motion in the opaque particles floating through the water. On moving the watch-glass, so as to bring one of the apertures of the sponge fully into view, he beheld, for the first time, he says, the "splendid spectacle of this living fountain, giving forth from a circular cavity an impetuous torrent of liquid matter, and hurling along in rapid succession opaque masses, which it strewed everywhere around. The beauty and novelty of such a scene in the animal kingdom long arrested my attention; but after twenty-five minutes of constant observation, I was obliged to withdraw my eye from fatigue, without having seen the torrent, for one instant, change its direction, or diminish in the slightest degree the rapidity of its course. I continued to watch the same orifice, at short intervals, for five hours, and sometimes observing it for a quarter of an hour at a time, but still the stream rolled on with a constant and increasing velocity."

In the Mediterranean Sea, about the islands of the Archipelago, sponges are found adhering to the rocks, from which they are not detached without considerable effort. In several of the Greek islands the inhabitants have been trained from their infancy to dive for sponges. The extraordinary clearness of the water facilitates their operations.

At the Cyclades, sponge-diving forms the chief employment of the population. The sea is, at all times, beautifully clear, and the experienced divers are capable of distinguishing from the surface the points to which the sponge is attached below, where an unpractised eye could but dimly discern the bottom.

Each boat is furnished with a large stone fastened to a rope, and this the diver seizes in his hand, on plunging head-foremost from the stern. He does this in order to increase the velocity of his descent, thus economising his stock of breath, as well as to facilitate his ascent when exhausted at the bottom, being then quickly hauled up by his companions. Few men ever remain longer than about two minutes below; and as the process of detaching the sponge is very tedious, three and sometimes four divers descend successively to secure a particularly fine specimen. Sponge-fishing takes place, also, on other coasts.

SPONGE-FISHERS AT CUBA.

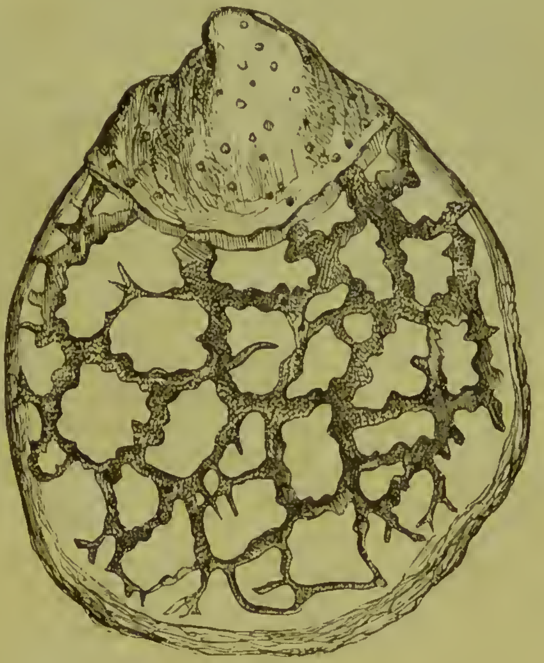
THE CLIONA.

Many species of this sponge are known. Of these twelve belong to the British seas; the rest exist in various parts of the world. They are most numerous in warm climates; none have been yet procured from the Polar regions.

On the coast of Northumberland the surface of almost every piece of limestone near low-water mark is riddled by cliona; old shells, whether univalves or bivalves, are filled with it. "I have seen," says an intelligent observer, "half-grown living oysters with cliona extending from the umbones almost to the ventral margin, and in one or two instances it even reaches that margin. In these cases it is evident that the growth of the sponge must have been more rapid than that of the shell, for the work of destruction could not commence until the oyster had attained to some size; and, had its growth been even equal to that of the sponge, the shell ought to have reached its full development before the sponge had gained the lower margin."

Only let this creature commence its attack, and it pauses not until it has acted throughout the entire substance. Before long the middle portion is almost completely excavated, and only small pieces remain to divide the chambers that have been formed. As, however, in the working of the Thames Tunnel, there was a "shield" for the defence of the miners, so the parasite at which we are looking leaves a thin plate on the outer and inner surfaces for its protection. Yet this serves only for a time; numerous circular holes are ultimately drilled in these plates, which are the only indication of the work of destruction beneath, until some slight force from without ruptures the protecting walls, or the increasing growth of the tenant bursts them asunder. The whole system of elaborately wrought chambers, becoming exposed, soon gives way, and the cliona, Samson-like, perishes amidst the ruin produced by its own energy.

THE CLIONA.

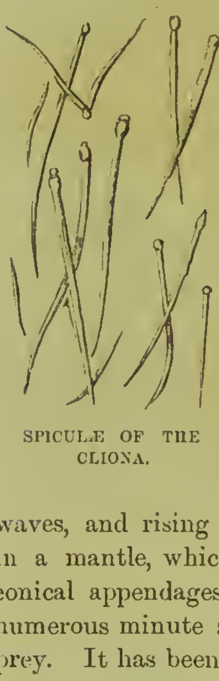


CELLS FORMED BY THE CLIONA.

The question naturally arises, How can such cavities be produced? Evidently by some instrument with which it is provided, like the whelk, which with its proboscis can bore holes in shells, or by a solvent. On this point Mr. Hancock remarks:—"The extreme simplicity of the organic structure of these beings forbids a belief in the existence of a special secreting apparatus. If, therefore, a solvent fluid be the agent, it must be supposed to exude from the entire surface of this humble animal. The character of the excavations would also lead to the same conclusion; for it is evident that the form of the sponge is influential in determining that of the chambers it inhabits. The test, then, can be easily applied, and, were the secretion of an acid nature, there could be little difficulty, one would think, in detecting it, particularly as cliona appears to work perpetually, at least so long as it continues to grow. I have completely failed, however, in detecting an acid." The calcareous particles, which may generally be observed strewed along the branched channels in the shell of the oyster, when inhabited by cliona, afford, as Mr. Hancock observes, a pretty strong proof of mechanical agency.

This, however, he proceeds, we think satisfactorily, to describe; for, if a portion of the superficial covering of the animal be carefully removed, and placed between plates of glass, with the external surface uppermost, and treated with strong nitric acid, large crystalline bodies of a peculiar character are scattered over it. These bodies are of a pale straw colour, and of the most brilliant lustre and gem-like beauty, the largest measuring one six-hundredth of an inch across. They are mostly irregularly six-sided, depressed, and scale-like, but stout, and frequently thickened in the centre, the upper surface being covered with numerous elevated, lozenge-shaped points, each generally having an expanded base, of a squarish form, slightly raised above the common surface. These bodies are frequently congregated into groups, and are occasionally placed together side by side. Strong nitric acid does not in the least affect them after many days' immersion, the sharp angularity of the elevated points remaining unimpaired, and their brilliancy undiminished. From these facts, and from the manner in which these bodies reflect light, there can be little doubt that they are composed of silex, or of some other substance equally dense.

Nor is this all: other crystalline bodies crowd the surface, which are as brilliant as the former, and, like them, resist strong nitric acid. These are mostly minute, being generally one six-thousandth of an inch wide; they vary, however, considerably in size, and are occasionally very much larger; they are mostly angulated, have an expanded scale-like base, and much resemble the lozenge-shaped points of the larger bodies. These smaller ones are crowded together into dense masses; occasionally they become united by their expanded bases, and then the mass has a considerable resemblance to the larger forms.


SPICULÆ OF THE CLIONA.

All, then, that is required is, that each granule, or cluster of granules, should be set in motion; nor would anything more than limited action be necessary. The motion of cilia, according to Ehrenberg, is produced by the contractile tissue on which they are based; and if the siliceous bodies now described are connected with a similar tissue, the whole surface of the sponge would be composed of thousands of minute drills, quite able to cut into the hardest calcareous substances.

THE CLIO BOREALIS.

This animal, a kind of marine slug, has a pair of wing-like fins, or oars, attached to its neck, and may be compared to the double-paddled oar with which the Greenlander propels and steers his kajak through the seas which the Clio navigates. Thus the animal rows itself merrily along, playing amidst the foaming waves, and rising or descending at pleasure. But, more remarkable still, the head is enveloped in a mantle, which can be retracted at pleasure, so as to expose the mouth, surrounded by three conical appendages on each side, covered with red points—transparent cylinders, in fact, sheathing numerous minute suckers, capable of being protruded, and acting as organs for seizing and retaining prey. It has been calculated that the total number of these suckers upon the head of a single clio amounts to 360,000—an apparatus for prehension probably unrivalled in the creation.

THE JELLY-FISH.*

Of the growth of this creature an interesting story may be told. A little oval body, covered with very fine hairs, swam about in the sea for some days, and then fixed itself by its smaller lower end. The opposite end now became depressed, the four corners became lengthened, and these were soon changed into tentacles, which so multiplied as to cover the upper end. Then transverse wrinkles might be observed on the body at regular distances, appearing first above and very slight, afterwards extending downwards, but all growing deeper and deeper, the edge of each one becoming serrated, or saw-like, so that the creature presents the appearance of a pine cone, surmounted by a tuft of tentacles. A separation is meanwhile going on, until the divisions resemble a pile of cups placed within each other. The upper ring is first detached, the others successively follow, and each one continues its development by itself, until it becomes a complete Medusa, or Jelly-fish. Thus what was at first a single individual becomes, by minute division, a number of entirely distinct animals. Moreover, the upper segment is

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* Medusa.

not developed like the rest: it is intended merely to favour their growth by securing and preparing the substances they need; and its office appears to be performed as soon as the other segments begin to be independent.

Of the jelly-fishes there is an immense variety:

> "Some in huge masses, some that you may bring
> In the small compass of a lady's ring;
> Figured by hand divine, there's not a gem,
> Wrought by man's art, to be compared with them."

They consist generally, when full grown, of a large, circular, gelatinous disc, convex above, and somewhat concave on the under surface, from which the feeding organs hang pendent. Strange to say, little fishes, alarmed by the sight of an enemy, rush under this mushroom or umbrella-like form, to remain until the danger is past, and then emerge again to sport and play about their sheltering friend. Fresh light is being continually thrown on the structure, varieties, and habits of the jelly fishes; and the more we know of them, the greater is our astonishment and admiration.

THE JELLY-FISH.

Astounding, indeed, is the story of a medusa's growth; yet, if possible, still more so is the fact that this creature has eyes, "each of which," says Mr. Gosse, "is a gelatinous spherule of a deep red tint, protected on each side by two pairs of long, pendent lobes. When crushed beneath the compressorum, it discharged a multitude of prisms of highly refractile substance, set close together. They were roundish in outline; but on causing some to turn over, to my great astonishment, I found them to be really *double-convex lenses*, pretty regular in their curvature, though not accurately so; while there were scattered among them a few straight prismatic specula."

Night often presents to the eye of the voyager a phosphorescent scene of unrivalled splendour and beauty. It is as if the sea were an immense plane of glass studded with diamonds of the first magnitude; or as if the luminous points with which its whole surface was literally bestrewed were sparks of fire. If they are regarded, as they have been, as efflorescences of flame, they pass the sides of the vessel every moment, and form in her wake a train of brilliancy such as no comet e'er "drew o'er half the heavens." Sir Walter Scott thus pictures it in vivid words:—

> "Awaked before the rushing prow,
> The mimic fires of ocean glow,
> Those lightnings of the wave;
> Wild sparkles crest the broken tides,
> And flashing round the vessel's sides,
> With elfish lustre lave;
> While far behind, their livid light
> To the dark billows of the night
> A gloomy splendour gave."

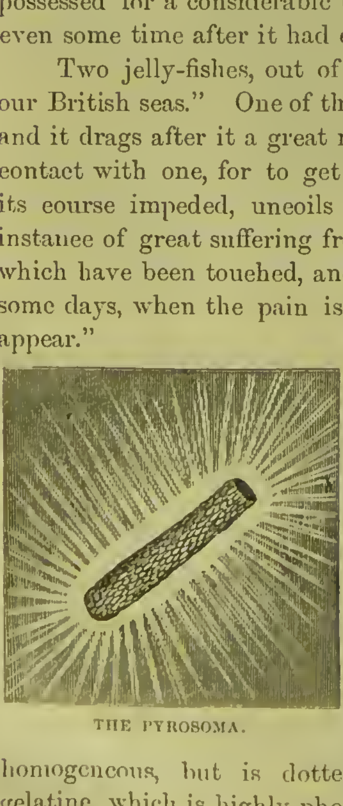
Dr. Poppig, in his "Voyage to Chili," says: "From the top-mast the sea appeared, as far as the eye could reach, of a dark red colour, and this in a streak the breadth of which was estimated at six English miles. As we sailed slowly along, we found that the colour changed into brilliant purple, so that even the foam, which is seen at the stern of a ship under sail, was of a rose colour. The sight was very striking, because this purple streak was marked by a very distinct line from the blue waters of the sea, a circumstance which we the more easily observed, because our course lay directly through the midst of this streak, which extended from south-east to north-west. The water taken up in a basket appeared, indeed, quite transparent; but a faint purple tinge was perceptible when a few drops were placed upon a piece of white china, and moved rapidly backwards and forwards in the sunshine. A moderate magnifying glass showed these little red dots, which only with great attention could be discovered with the naked eye, consisting of animalcules, which were of a spherical form, entirely destitute of all external organs of motion. . . . We sailed for four hours, at a mean rate of six English miles an hour, through this streak, which was seven miles broad, before we reached the end of it; and its superficies must, therefore, have been about a hundred and sixty-eight English square miles. If we add that these animals may have been equally distributed in the upper stratum of water to the depth of six feet, we must confess that their numbers infinitely surpassed the conception of the human understanding."

Hence Crabbe says to the sea-side visitor—

"While thus, with pleasing wonder, you inspect
Treasures the vulgar in their scorn reject,
See as they float along the entangled weeds,
Slowly approach, upborne by bladdery weeds;
Wait till they land, and you shall then behold
The fiery sparks those tangled fronds enfold;
Myriads of living points: the unaided eye
Can but the fire, and not the form, descry."

Spallanzani affirms that this phosphorescence is owing, in the medusæ, to a glutinous substance issuing from certain parts of the body. Expressed into different liquids, as into salt water, but especially into fresh water, warm, or milk, it gives to them a phosphoric light. "A single jelly-fish," he says, "thus expressed into twenty-seven ounces of cow's milk, rendered it so resplendent that we might have read the character of a letter by it at the distance of three feet. The dead medusa possessed for a considerable time its phosphorescence, and it was renewed by pouring water upon it, even some time after it had ceased to shine."

Two jelly-fishes, out of an immense variety, are, according to Forbes, "the only true nettles of our British seas." One of these—the Hairy Cyanea—has a dingy, dark-brown disc, about a foot across, and it drags after it a great number of filaments, like coarse hair. Woe to the bather who comes into contact with one, for to get out of its entangling meshes seems impossible, until the creature, finding its course impeded, uncoils its hair, and leaves him to himself. We have known more than one instance of great suffering from such an accident. There appears a considerable redness in the parts which have been touched, and swellings of the same colour. Dicquemare says: "After the end of some days, when the pain is gone by, the heat of the bed will cause the blisters of the skin to re-appear."



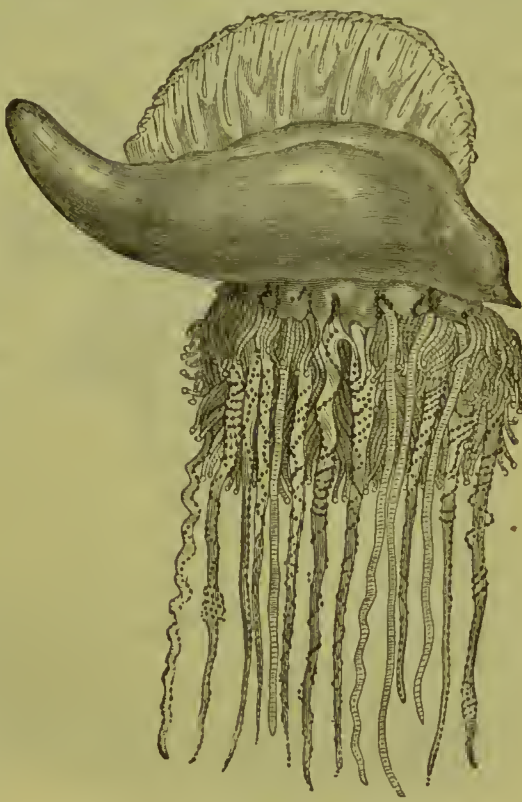
THE PYROSOMA.

Another singular fact should not be omitted. If a common jelly-fish be taken from the sea or the shore in some vessel and carried home, and if it be looked for a few hours after, it will be gone. All that remains will be water, not distinguishable by the chemist from sea-water, except a small piece of membrane: yet these, with life, formed a medusa—a creature gifted with many powers.

THE PYROSOMA.

A SIMPLE, semi-transparent, gelatinous tube, hollow, with a distinct aperture at the larger end, and also at the opposite end, has attracted the particular attention of the naturalist; yet, marvellous to say, it is not homogeneous, but is dotted all over with granulations, set together in the substance of the gelatine, which is highly phosphorescent.

Examined minutely, they will be found to have open mouths, and are, in fact, distinct animals, cemented, as it were, together. According to MM. Audouin and Milne Edwards, they are at first free and independent, and are thus conglomerated into a tube only at a certain period of their existence. Of these creatures there are several species.* Enveloped in a flame of bright phosphorescent light, gleaming with a greenish lustre, they present, when the water in which they float is agitated, a brilliant spectacle.


THE PORTUGUESE MAN-OF-WAR.

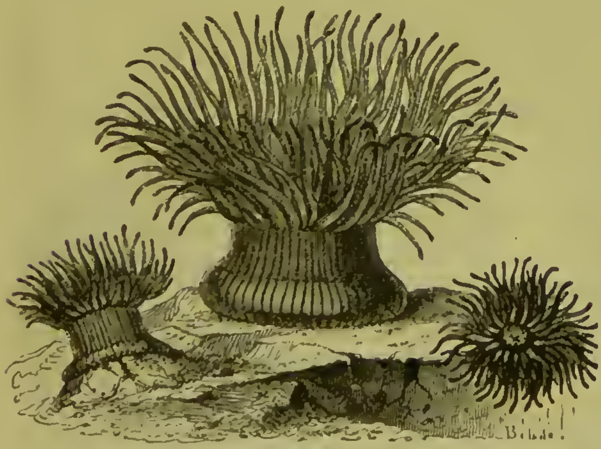
THE PORTUGUESE MAN-OF-WAR.†

The body of this creature is buoyed up by a sort of bladder, which it is said to have the power of inflating at will, so as to be able to rise or sink at pleasure. The bladder is nearly egg-shaped, with a sort of snout at one end, and a pointed tail at the other, and crested with a crenate ridge of fine purple. The surface is glossy, and reflects all the colours of the rainbow. From the lower side of this singular organ depend a great number of tubular filaments, gay with brilliant, changeable tints of green, blue, and gold.

The Physalia is common in the seas of warm countries, but is seldom captured on the British coasts.

THE SEA ANEMONE.‡

A varied class of marine creatures is formed of the Sea Anemones. The external part consists of bundles of muscular fibres, some running perpendicularly, others transversely, and the intervening spaces between the fibres thus interlaced are numerous small granular bodies, which are universally distributed, except at the base. Over this tissue is a mucous layer, forming an epidermis or outer skin. The tentacles or arms on the upper surface are tubular, with a minute orifice at their extremities, and their interior communicates with a compartment between the stomach and the outer wall of the body—a compartment which is not single, but divided by membranous partitions into numerous chambers, between which there is a free communication. This divided cavity is the aerating apparatus, filled with the sea water, drawn in through the tentacles, and expelled when the anemone contracts, a fresh supply being absorbed on the dilation of the body, at the pleasure of the animal.


SEA ANEMONES.

Gentle as this creature may appear, all such appearances are deceitful, for it is very voracious. It will wait even for a crab or a mussel with extended arms; only let it come within their grasp, and they instantly close around it, and by their contraction force their prey into the mouth, which has opened to engulf it. Only the soft parts of the prey, however, are retained; the shells are speedily disgorged through the mouth.

It is a curious fact that the sea anemones, of which there is a great diversity, are like Achilles, invulnerable except in one spot. They will bear an extraordinary amount of cutting and tearing, if only the base is kept unlacerated. Exquisite little creatures, torn in two by the splitting of the stones on which they rested, have displayed each half acting as vigorously as if nothing had interfered with its integrity. In the course of some weeks not a trace was left that they had ever been wounded. The Abbé Dicquemare relates that he cut an anemone in two transversely, when the upper portion instantly expanded its tentacles and began feeding; in about two months tentacles began to grow from the cut extremity of the other portion, and thus he obtained two perfect anemones in the place of one. How marvellous is the tenacity of animal life!

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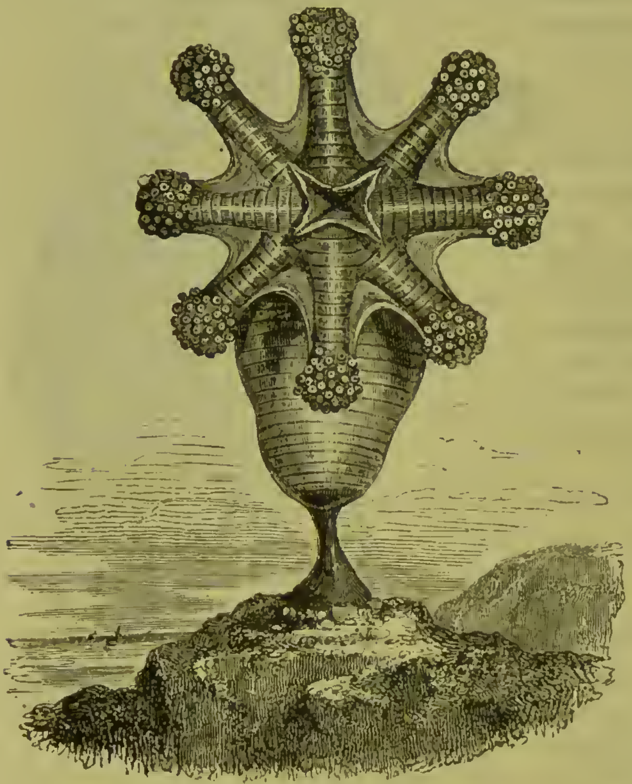
* Pyrosoma Atlanticum; P. elegans, &c. &c.

† Physalia.

‡ Actinia.


LUCERNARIA OCTO-RADIATA.

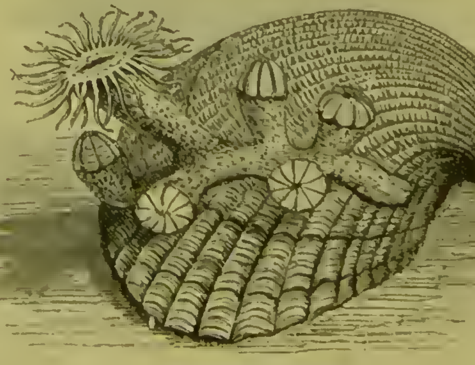
The striking resemblance in form of these creatures to many of our compound flowers, led to their being called the sea anemone, the sea carnation, the sea marigold, the daisy, the sunflower; but the first-mentioned name is the one now commonly in use. A great variety of them may be found on divers parts of our coast, but no one species is so abundant as the Beaded Anemone.*

A family called by Cuvier *Lucernaria*, has been placed by him near to the sea-anemones. These are soft-bodied animals, which fix themselves to different kinds of sea-weed, and to other marine substances, by means of a slender stem or pedicle. Their upper part is dilated into a form resembling that of the flower called the African marigold. The tentacles, or feelers, are arranged in bundles at the extremity of the branches, or petals, and the mouth is in the centre. The edge of the species engraved consists of eight divisions, with a corresponding number of groups of tentacles; and hence its name.

Nearly allied also to the sea-anemones is the genus termed *Zoanthus;* the polyps closely resemble the anemones, but they are united together on a common base, and are therefore individually not so independent. We have engraved the species, *Zoanthus couchii.*

THE GREEN HYDRA.†

A CLEAR idea of a polyp may be obtained from the examination of this small fresh-water animal, common in weedy ponds or slowly-running streams. It consists of a tube, about three-eighths of an inch in length, which is contracted at one end, and provided with a small sucker, for the purpose of adhering to stems and leaves, while the other end, which may be considered the mouth, is surrounded by a number of filaments, which serve as arms. These arms are so long in one species, that it is called the Long-armed Hydra.


ZOANTHUS COUCHII.

The microscope shows that the hydra has a granular structure—a substance containing many small grains, and covered by albumen, but neither nervous nor muscular fibres. No vessels of any kind can be discovered; there are no rings as in the worm, nor any organs of sense. It is, in fact, a jelly-like creature, with small grains intermixed. And yet, here is a living being which can change its place, appreciate the presence of light, by which it is sensibly affected, and wage war with others of a higher grade than itself. It is, too, so tenacious of life, that if cut lengthwise, or across, or even into several parts, by means of a pair of fine scissors, each one becomes a perfect animal. If cut transversely in three parts, then in four or five days in summer, and longer in cold weather, the middle piece will produce a head and tail, and the tail a head and body. The head part appears to perfect itself sooner than the rest. So little inconvenience do such operations appear to give, that the head-part of a hydra cut in two, has been seen in a few minutes to expand its arms, and catch prey as usual. It is equally, if not more extraordinary, that when these creatures are thus produced, they grow much larger, and increase much more, than those not multiplied by artificial division. The common reproduction of these animals is plant-like, by gemmules, or buds; these sprout indifferently on any part of the animal's body, gradually assume their true form, and become detached and independent.

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* Actinia mesembryanthemum.

† Hydra viridis.

It appears that the hydra has a high degree of nervous sensibility, for it is mostly found at the surface of the water; it adheres to plants exposed to light; and it is so influenced by light, that when several are confined in a glass, they seek that side which is most illuminated. The creature also feels, and particularly when the mouth is surrounded by filaments, which are affected by other bodies, or even the smallest particles. When alarmed, or touched roughly, moreover, it shrinks into the form of a small globule, which might easily escape notice. It can also wander about in the water according to circumstances: the usual modes of proceeding along the stem or leaves of a plant is, however, slow. It fixes the tail, by means of its sucker, so as to attach itself securely; then forms a semicircle with its body till the mouth touches the surface of the leaf, or other substance, on which it is stationed. It now adheres by the mouth, or the arms, unfixes the tail, draws it close to the mouth, and then fastens it; it then raises the body, again bends it down and adheres by the arms, and brings the tail up to the mouth as before, and so on in succession.

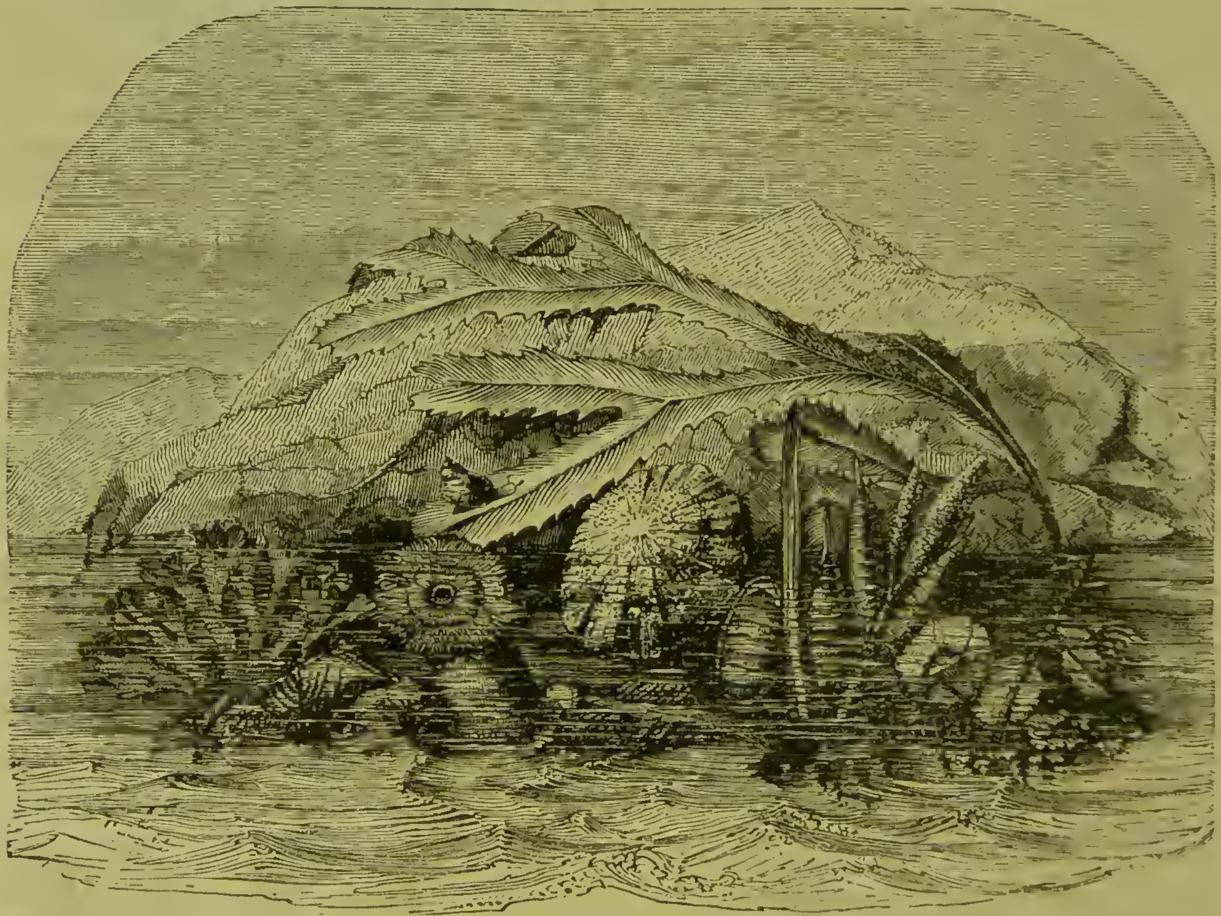
So tedious, however, is this mode, that several hours are required for a journey of a few inches. It can, therefore, adopt one more expeditious, which consists of a series of somersaults: adhering by the arms and the tail, the hydra detaches the latter, but, instead of bringing it up to the mouth, throws it beyond as far as possible. It thus describes a semicircle, which, being made, the same movement is performed by the head. In the water the hydra moves much more rapidly; suspended with its head downwards, and with its sucker acting as a float on the surface, it is drifted with the current of the water, wafted along by the breeze, or grasping objects within its reach, it propels itself along; till, holding firmly by a stem or leaf, it moves itself into a state of rest.

A, GREEN HYDRAS, ATTACHED TO A WEED; B, LONG-ARMED HYDRAS.

That a living tube should not only be voracious, but able to seize and swallow such animals as insects and minute fishes, is surprising, yet not more strange than true. Watching for its prey, the hydra remains with its arms spead widely out, and motionless. The moment some tenant of the water, suited to its purpose, approaches, its course is instantly stopped by these arms, and, notwithstanding all its efforts to escape, appears fixed by some power which it cannot overcome. It is now gradually dragged to the mouth, which opens to receive it, and forced into the stomach, where it may be observed through the transparent body of the hydra, until the process of digestion renders it indistinct, giving a dull opacity to the body of the devourer. The power of the arms in arresting the prey is not well understood; it has been attributed to a viscid secretion, acting like birdlime; but it has been observed that, when the hydra is satiated with food, and animals are brought into contact with the arms, they are not arrested, but easily escape.

It cannot be doubted that the hydra is to be reckoned among poisonous creatures, being endowed with the power of killing the softer animals on which it preys. Small water-worms, which the hydra is accustomed to attack, are said to be so tenacious of life, that they may be cut in pieces without seeming to suffer much pain, or to receive any material injury. But the poison of the hydra at once ends all life and motion; no sooner has its mouth touched this worm than it expires, and yet there is no appearance of a wound on the dead animal.

Other circumstances lead to the same conclusion: the best microscopes have shown that the hydra is neither provided with teeth, nor any other means of piercing the skin. It appears that fishes refuse to swallow this creature; the hard shells of some insects, on which it largely preys, seem a defence from the poison of their enemy, and when they escape they swim about unharmed. The hydra is said to seize a worm as eagerly as a cat does a mouse. A close observer of this creature has sometimes forced a worm from one the moment it has been touched by the mouth of the hydra, at the expense of breaking off the arms of the adversary, and it has always died very soon afterwards. It appears, therefore, that from the poison it possesses, it is enabled to overcome the struggles of worms far superior to itself in power and activity; to them its arms are deadly instruments, within the grasp of which they are paralysed and death-struck.



THE RISING WATERS.

It would seem that the small grains of the jelly-like body of the hydra perform some important service in assimilating the nutritive particles of the food, as they change their colour according to that of their prey. The action of the stomach on the food received is very rapid; but it has no power on any part of the animal, as the arms are frequently coiled round the prey, while it is undergoing digestion. Nor does one polyp of the same species, if swallowed by a larger individual, appear to be acted on by its digestive powers.

M. Trembley, to whose observations of this creature we are most indebted, saw, on one occasion, a contest between two of them for the same prize, and what was the result? The strife ended by the larger swallowing the smaller hydra, together with the object of their mutual struggle. He now considered the fate of the smaller hydra as certain, but it was not. After the devourer and the devoured had digested their mutual captive, the swallowed hydra was disgorged alive, and apparently without having suffered the slightest injury.

THE bottom of the basin of the sea, having mountains, valleys, and plains, like those of the surface of continents, is covered by immense quantities of shelly creatures, intermixed with sand and gravel. At the bottom of the Adriatic Sea there is a compact bed of shells, several hundred feet in thickness. In many seas the eye beholds only a bright, sandy plain at bottom, stretching for several hundred miles, without an intervening object. But of others we may say—

"The floor is of sand, like the mountain drift,
And the pearl-shells spangle the flinty snow;
From coral rocks the sea-plants lift
Their boughs, where the tides and billows flow:
The water is calm and still below,
For the waves and winds are absent there,
And the sands are bright as the stars that glow
In the motionless fields of upper air.
There, with its waving blade of green,
The sea-flag streams through the silent water;
And the crimson leaf of the dulse is seen
To blush, like a banner bathed in slaughter."

THE RETIRING WATERS.

"There are few things," says Captain Basil Hall, when in the West Indies, "more beautiful to look upon than the corallines, when viewed through two or three fathoms of clear still water. It is hardly an exaggeration to assert that the colours of the rainbow are put to shame on a bright sunny day, by what meets the view on looking into the sea in these fairy regions."

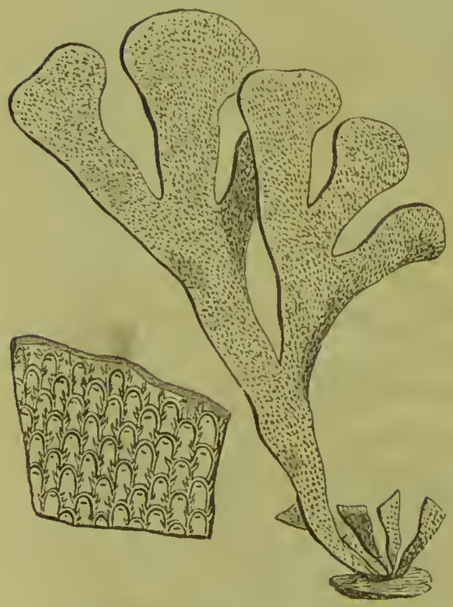
An idea of the spectacle may be formed from the view of a rock over which the waters rise and from which they retire.

Attached to a stem, picked up on the coast, there may be a form of life not yet considered. You say, perhaps, "It is a sea-weed;" and certainly it bears a strong resemblance to one, but its growth, structure, and character are very different. A very minute body alighted on a stone, or shell, having however, a strong liking for the latter. It was not long before it put forth a stem, and, as this advanced, a branch emerged from each side, and, what is still more remarkable, it was covered by a series of little cups, each one having in it a little creature called a polyp. In this way life and growth continued, until, as the stem heightened, there were several branches, and a proportionate number of cells and polyps. Such was the history of any little coralline, as the Sickle-beard, or others yet to be mentioned. Dr. Landsborough, when dredging for marine objects in Lamlash Bay, surprised the boatmen by the eagerness with which he seized creatures of this kind. When, dipping one in water, it spread out into an elegant white plume, they said, with astonishment, they did not think "there was onything sae bonnie to be got in the bay."

THE GREAT HORN-WRACK.*

THIS coralline is of common occurrence. It is called Lemon-weed, because, when burnt, it has the odour of that fruit; and when just taken from the ocean has frequently a scent like that of violets, or of the orange, but it disappears when the coralline is dried. Some specimens, however, have no such odour.

This plant-like animal is, apparently, a dirty white, papery substance, branching forth in various directions; but, examined even by a pocket lens, it will prove to be a most extraordinary structure. Its flat surface is actually built up of innumerable little cells, placed back to back, like those constructed by the bee, while each one is defended by four projecting spines, which arise from its calcareous margin. There are, in fact, two spines on each side of the aperture; the upper two being twice the length of the lower pair, and slightly curved upwards. These spines give the skeleton its roughness, of which the fingers are sensible when passed gently over its surface.


THE GREAT HORN-WRACK. THE CELLS MAGNIFIED.

It would be an error to suppose that an object of this kind, picked up from the sands, is the residuum of a single animal; it rather resembles a village, a town, a city—an aggregate of dwellings; each cell being to each individual its place of birth, of life, and of death. Nor is this all: his cell was his house; more literally his skin, and here he enjoyed an independent existence, just like Brown Jones, or Robinson in their respective dwellings. But while each of these notorious persons cherished not only interests entirely individual, but others which were imagined to belong to their several coteries, and, consequently, Brown was often at issue with Jones, and Jones with Robinson, and "the set" of any one was in antagonism with the set of either of the others, a contrast is presented by the leafy body, or *polypidan*, now under consideration. For though the little cell-dweller lived independently, he was united, by a common circulation, to the cells below and above him; thus having, not a rival, but a double existence; being, of course, himself, but at the same time a part of his neighbours, who occupy the other cells; thus presenting the extraordinary paradox of a single, and yet a compound animal, associated with the rest in a sort of republic, where the labours of all are exerted for the benefit of the whole society.

THE FLAXEN FLUSTRA.†

THE cells on one side of this coralline are large and smooth, the polyps have about twenty-two arms, and there appear to be about fifty cilia on each side of an arm, making 22,000 cilia on each polyp. In this species there are more than eighteen cells in a square line, and 1,800 in a square inch of surface; and as the branches of an ordinary specimen present about ten square inches of surface, it has more than 18,000 polyps, 396,000 arms, and 39,600,000 cilia.

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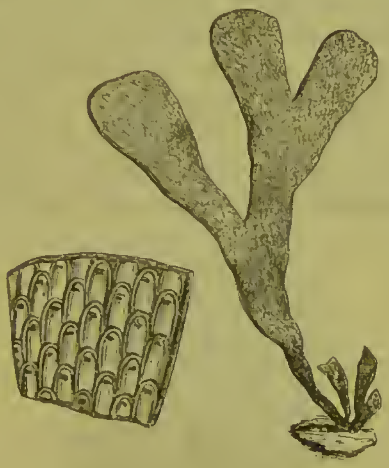
* Flustra foliacea.

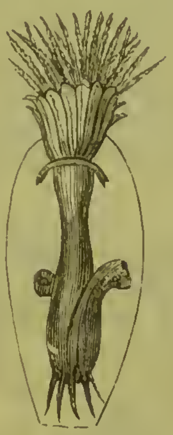
† Flustra carbacea.

PLUMARIA FALCATA.

THIS elegant species is very common. It rises frequently to the height of eighteen inches, in wide, spiral turns, and sends out from its stem a series of cells, and, at regulated intervals, spreading branches, which are placed one above another on the outer side.



THE FLAXEN FLUSTRA. THE CELLS MAGNIFIED.

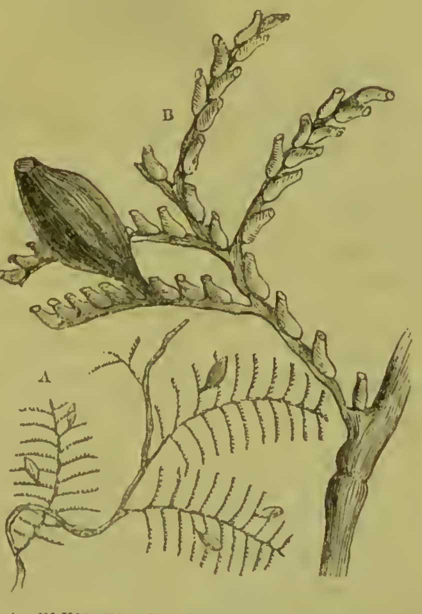


POLYP OF THE FLAXEN FLUSTRA.

TUBULARIA INDIVISA.

THE tubes of which this coralline is formed are sometimes about as thick as a common-sized pin; but in other instances they are somewhat larger. Sometimes they are divided at the base, where they are twisted and flexuous, and sometimes they are wrinkled at distinct intervals. They are horn-coloured, and from six to twelve inches in height.

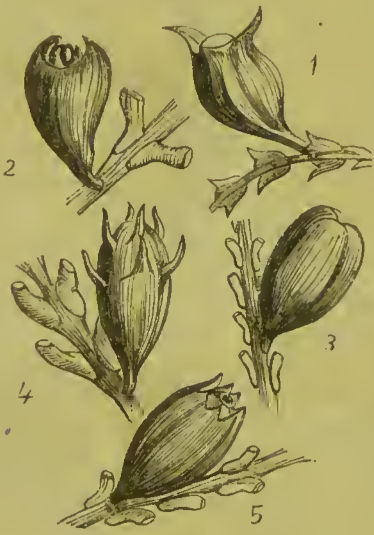
Ellis describes one of these tubes as like part of an oat-straw with the joints cut off. They are filled with a soft, almost reddish-pink pulp; the polyps project from the open ends of the tube, and are not retractile within them. The body, or naked portion, forms a globular knot of a scarlet colour, protruded above into a sort of proboscis encircled with a series of short arms of the same character. Around the base of this body there is another circle of much larger arms, from thirty to forty in number. The neck of the polyp is greatly constricted. A recent tube is marked with several longitudinal pale lines, placed at equal distances, which are evidently caused by some peculiar structure of the internal pulp; for when empty, the tubes exhibit no such appearance. As the animal becomes weak when kept in a basin of sea-water, the head drops off like a flower from its stalk; and even if it is immersed when most vivacious, in fresh water, the pulp is expelled from the tubes till they are almost emptied.



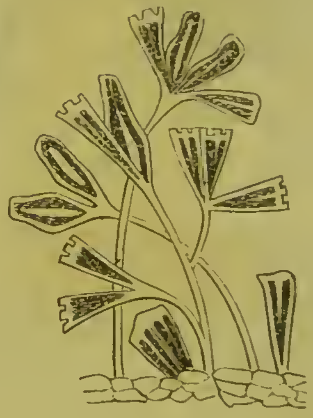
A, PLUMARIA FALCATA; B, THE SAME MAGNIFIED.

In the spring of the year, vesicles may be seen growing from corallines, differing greatly in form, size, and character. Here the germs of a future race, each one arrayed with vibrating cilia, float about in a fluid, in which currents are produced by their motion. On the rupture of a vesicle, these germs attach themselves to neighbouring substances. Now they become flat and circular, and their more opaque parts radiated, so that they appear, even to the naked eye, like so many minute, gray-coloured stars, having the interstices between the rays filled with a colourless, transparent matter, which seems to harden into horn. The gray matter swells in the centre where the rays meet, and rises perpendicularly, surrounded by the transparent horny matter, so as to form the stem of the future zoophyte. The rays first formed are the fleshy, central substances of the roots, and the portion of that substance which grows perpendicularly forms the fleshy part of the stem.

Corallines of a fibrous or fleshy texture are the inhabitants of a deeper water, and are never left uncovered. When, however, they are exposed, from their locality, to an unusually great agitation of the sea, they are said to have a structure proportionably dense and compact. In the intertropical latitudes they display gigantic forms, and strange or grotesque figures; in the colder latitudes they are smaller, and of firmer and more rigid texture. They often grow in places which the returning tides leave dry; but their congenial abode is in sheltered and tranquil spots, in caves and fissures of rocks, where the water, never ruffled by the storm, is "deeply, darkly, beautifully blue." Fixed, plant-like, to the rock, they festoon the deep sea caves; they line the walls of submarine grottoes, and hang as grotesque ornaments from the roof; some like inverted goblets, aptly termed "Neptune's drinking cups;" some like fans, some like globes, and others like intertwined branches of fantastic growth.



VESICLES OF CORALLINES.—1. Cupresina. 2. Rosacea. 3. Nigra. 4. Margareta. 5. Pinaca.



THE FAN-BEARER.

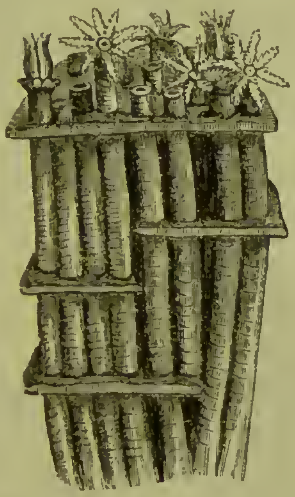
A new world for examination and research opens here before us. There is an immense diversity manifest among these corallines. In some of them there is a transparent, horny cell which closely embraces the body of the polyp, nearly unyielding in its lower two-thirds, but terminating above by a flexible portion which serves to protect the upper part of the body when the whole is expanded, in which state it is of the same diameter as the rest of the cell; but, when the animal retracts, is folded up and drawn in after it, and completely closes the mouth of the cell. The flexible part consists of two portions: the lower half being a simple continuation of the rest of the cell; the upper consisting of a row of delicate bristle-shaped processes, which are arranged parallel with each other round the top of the cell, and are prevented separating beyond a certain distance, by a membrane of excessive tenacity, which surrounds and connects the whole. This mode of the termination of a cell is one of constant occurrence, and is evidently a provision for allowing the freest possible motion of the upper part of the body in its expanded state, to which it affords, at the same time, support and protection.

The number of polyps on a single coralline is often absolutely astounding. In a specimen of the Crested Plumularia there have been counted something like 24,000 inhabitants. In a coralline taken by Mr. Dana in the East Indies, this number was greatly surpassed. There were about 12,000 polyps to each plume or branch; and as the coralline, being three feet long, bore these plumes, on an average, every half-inch on opposite sides, the whole number of polyps was not less than 800,000,000—a number almost equalling that of the population of our globe, yet all produced by the successive buildings of a single germ.

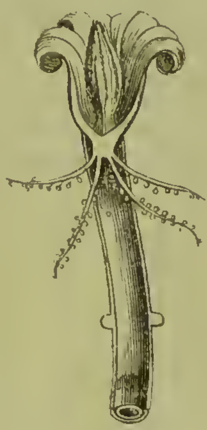
Lister, the naturalist, observed a singular fact in reference to a coralline. After keeping it in a large bowl for two days, he saw that the polyps drooped and were thrown off, and lay at the bottom of the vessel, of a pink colour, which, when it had stood quietly for two days, became a very fine powder. Thinking that the cells were dead, he was about to throw them away; when, on returning home after two days' absence, he found a thin, transparent film protruding from each cell. He then changed the water, and in three days every cell had produced a new polyp, differing but slightly from their former inhabitants.

THE FAN-BEARER.

A curious creature is called the Fan-Bearer. The microscope reveals its fan-like leaves, sustained by slender glass-like threads; the leaves are of a yellow hue, diversely coloured, and marked with spots of a deeper tint. Each of the pieces or joints consists of a single cell, of a very delicate membrane. These plant-like creatures—how, it is not known—have the power of extracting silex or flint-earth from the sea, and fixing it in their tissues; and, as their bodies are indestructible, their remains accumulate under the sea. Their number, therefore, laughs at our highest attainments in arithmetic. Microscopic in themselves, they absolutely form beds of marl, chains of hills, and rocky strata in every part of the globe. The world is indeed one vast mausoleum of the remains of amazingly minute beings.



TUBIPORA MUSICA, WITH POLYPS.



POLYP OF TUBIPORA MUSICA.

In some instances may be observed a collection of tubes with bundles, like reeds bound together, and open at one end, through which the polyps protrude, and into which they can retire. So it is with the group represented in the engraving, deriving its name from its resembling a cluster of organ-pipes in miniature. Each polyp is a crimson tube, while the arms are of pure green.

THE RED CORAL.

Of "the deep, deep sea," it is said—

"There, with a slight and easy motion,
The fan-coral sweeps through the clear, deep sea;
And the yellow and scarlet tufts of ocean
Are bending like corn on the upland lea.

"And life, in rare and beautiful forms,
Is sporting amidst those bowers of stone,
And is safe when the wrathful spirit of storms
Has made the top of the waves his own.

> "And when the ship from his fury flies,
> Where the myriad voices of ocean roar,
> When the wind-god frowns in the murky skies,
> And demons are waiting the wreck on shore;
>
> "Then far below in the fearful sea,
> The purple mullet and gold-fish rove
> Where the waters murmur tranquilly
> Through the winding twigs of the coral grove."

Wellsted accordingly remarks:—"Through the bright blue, pellucid water, we could discern the minutest objects at an immense depth; and the secrets of the deep, thus laid open to us, afforded us the most magnificent spectacle that could be conceived, although there were neither

> 'Wedges of gold, vast anchors, wreaths of pearls,
> Nor other treasures of the vasty deep.'"

Ehrenberg was so much struck by the corals in the Red Sea, that he exclaimed with enthusiasm, "Where is the paradise of flowers that can rival in variety and beauty these living wonders of the ocean?"

Fragments of coral are familiar objects not only at the sea-side, but in all our homes. The common red kind has a beautiful branched axis, destitute of cells, covered with an animal bark, replete with granules of lime. The polyps, when expanded, resemble starry flowers, and very attractive must be the appearance of a large living branch. Each polyp has eight fringed oval arms, capable of being contracted within cells formed in the fleshy covering of the axis, which, however, do not penetrate the axis itself.

Masses of Madrepore, called Brain-stone, from the resemblance of its convolutions to those of the human brain, may be seen in all museums.

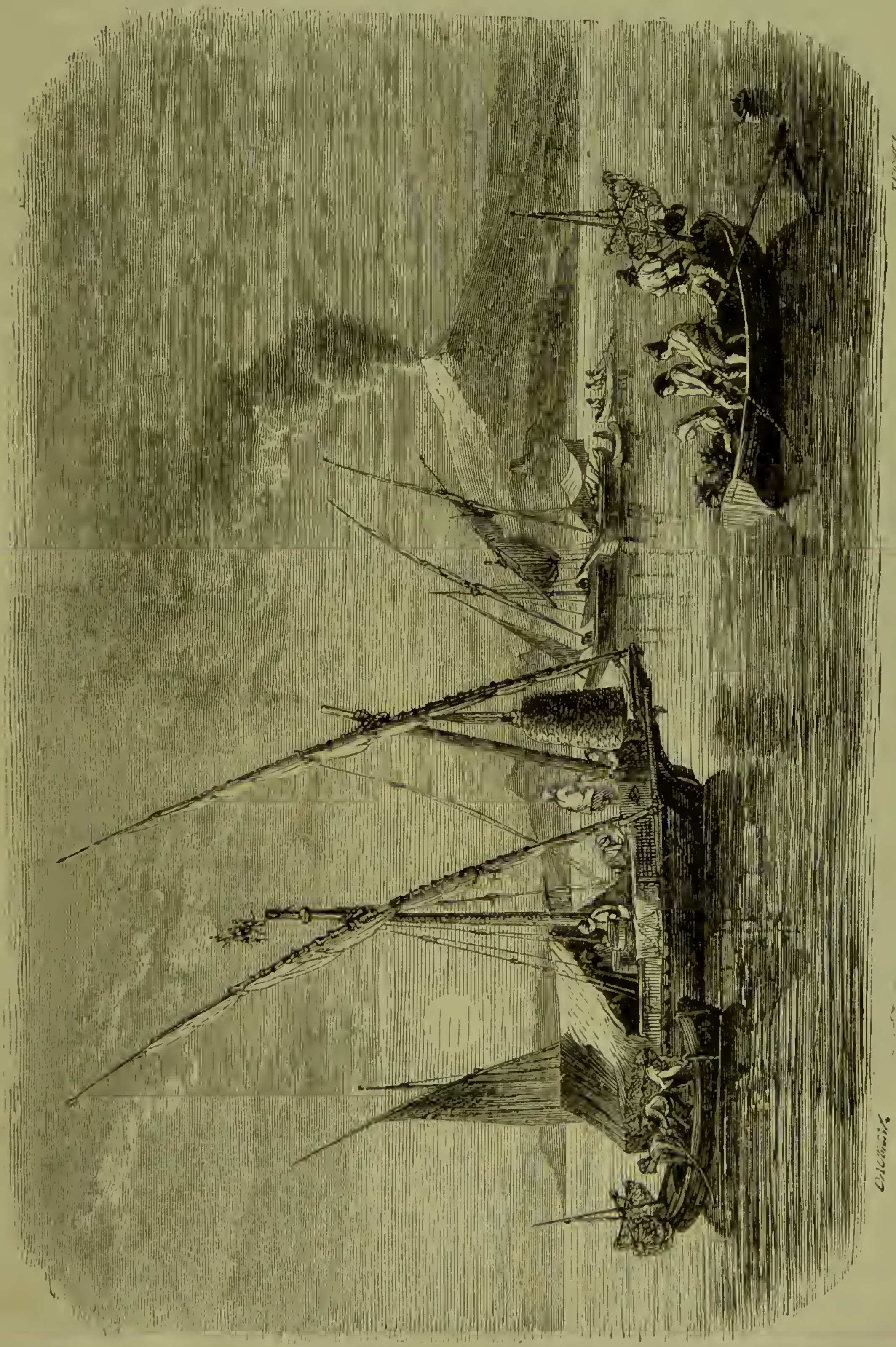
CORAL AND POLYPS.

MADREPORE, OR BRAIN-STONE.

The coral obtained on the south coast of France is in the highest repute for lively and brilliant covering; that procured on the Barbary coast is thicker, but of a less beautiful tint. Many different kinds are distinguished in commerce, and their value varies with their quality.

Sicily is noted for its coral. The principal fishery, as it is called, is established at Trepano. The mode adopted is very simple. A large cross of wood, with a heavy weight in the centre, having nets fixed to each limb, is let down horizontally, by means of a rope, into the sea. When this rude drag-net touches the bottom, the rope is made fast to a boat, and the fishers then row over the beds of coral, of which the stems and branches are broken off by the machine, and entangled in the nets. In the middle of the Straits of Messina, the rocks, at a depth varying from one hundred and twenty to two hundred yards, produce coral, which is collected annually. The same ground is dragged only once every ten years, in order to allow the growth to be completed. The coral fishery established off the coast of Barbary is conducted in a similar manner.

Polyps, adorned with beautiful colours, though of almost gelatinous texture, requiring the influence of light and the rays of the sun, and consequently never laying the foundation of their calcareous tenements in the dark and stilly depths of the ocean, form vast beds, upwards of a hundred feet in thickness, and even more, still covered by the water, and constituting a sunken reef. Again, on the contrary, as on the shores of Timor, near Coupang, they form a bed from twenty-five to



CORAL DIVING IN THE STRAITS OF MESSINA.

eighty feet in thickness, over rocks elevated above the level of the sea. But the grandest coral reef known is one which runs parallel with the north-east coast of Australia, varying in distance from the shore to the extent of twenty, and in some parts fifty, or even seventy miles, and stretching out for nearly one thousand miles in length. In the Indian and Pacific Oceans, however, far away from any land, huge masses of coral rock rise up from vast and often unknown depths, just to the level of low water. These masses are often unbroken for many miles in length and breadth; and groups of such masses, separated by small intervals, occur over spaces sometimes of four or five hundred miles long, by fifty or sixty in width. The barrier-reef along the north-east coast of Australia is composed of a chain of such masses, and is more than one thousand miles long, from ten to ninety miles in width, and rises at its side and edge from depths which in some places certainly exceed 1,800 feet.

These reef masses consist of living corals only at their upper and outer surface; all the interior is composed of dead corals and shells, either whole or in fragments, and the calcareous portions of other marine animals. The interstices of the mass are filled up and compacted together by calcareous sand and mud, derived from the waste and *débris*, the wear and tear of the corals and shells, and by countless myriads of minute organisms, mostly calcareous also. The surface of a reef, where exposed at low water, is composed of solid-looking stone, which is often capable of being split up and lifted in slabs, bearing no small resemblance to some of our oldest limestones.

CORAL.

Thus says the poet :—

> "I saw the living pile ascend,
> The mausoleum of its architects,
> Still dying upwards as their labours closed;
> Slime the material, but the slime was turned
> To adamant by their petrific touch.
> Frail were their frames, ephemeral their lives,
> Their masonry imperishable. All
> Life's needful functions—food, exertion, rest—
> By nice economy of Providence,
> Were overruled to carry on the process,
> Which out of water brought forth solid rock."

Again, it is said, with equal truth—

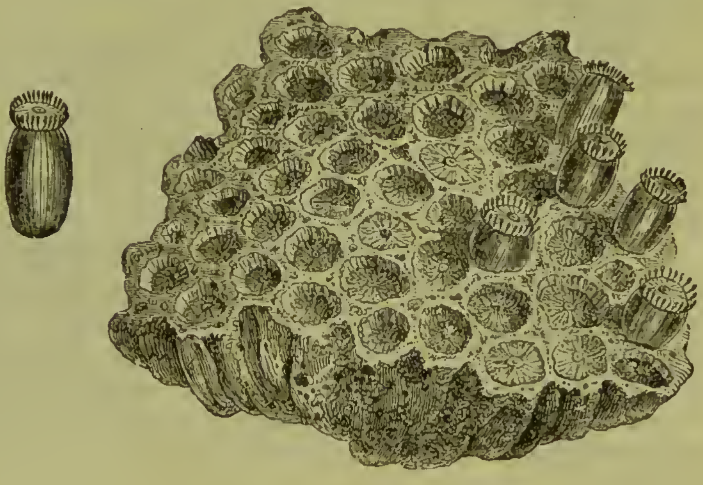
> "Punctures fine,
> In the close coral, capillary swarms
> Of reptiles, horrent as Medusa's snakes,
> Cover'd the bald-pate reef; then all was life
> And indefatigable industry.
> The artisans were twisting to and fro
> In idle-seeming convolutions; yet
> They never vanished with the ebbing surge
> Till pellicle on pellicle, and layer
> On layer, was added to the growing mass.
> Ere long, the reef o'ertopt the spring-flood's height,
> And mock'd the billows when they leapt upon it,
> Unable to maintain their slippery hold,
> And falling down in foam-wreaths round its verge."

In the formation of coral, each polyp is, indeed, merely a minute pouch of animated matter, with a few feelers about its mouth; but it is so organised as to secrete calcareous particles from its food, that it may build of them a limestone house; and still more, to send forth constantly from itself germs of the same structure, and adapted to do precisely the same work. And so, slowly and silently, millions of tiny arms, the members of a compound whole, ply earnestly their task, from generation to generation, till the work is completed.

To the coral-rock sea-birds repair, and uninterrupted, save by the noise around of tempest-tossed billows, rear their broods during many a returning season. The winds drop their seeds, the waters throw them on it; they germinate; the vegetable decays; and, in due time, a rich mould is provided to cover the surface. And now the larger seeds can spring up from a genial soil; the cocoa-nut tree and the palm wave their graceful heads; and even forests arise in all their verdure and luxuriance. At length man claims it as his own, and a multitude of human beings rejoice in its abundance.

The species principally engaged in this great work is the coral, called by Linnæus the Muricated Madrepore, and generally known by the name of White Coral. Vincent Rosa has given us an account of another species, that of the Fungus Madrepore. He tells us that from every cell there issues a cylindrical animal, about half an inch long and two lines in diameter, and of which the upper part or mouth is surrounded by about two-and-twenty very short tentacles. These animals, which are pendent—because this madrepore is always fixed under the projections of the rocks, and vibrates at the will of the waves—are always of a lively orange colour; they contract as soon as they are touched, and die on being taken out of the water. Whoever examines a fragment of any of the varieties of white coral will find it to consist of radiating tubes, absolutely countless, and variously intercepted, but all issuing from a common base; these are the receptacles of the polyps, while the connected individuals with their blossoms inhabit an infinity of cells opening externally, from which the tentacles issue to collect their food.

A coral reef commonly slopes gradually down to a depth of two, three, or four fathoms, and then slopes very suddenly into deep water, twenty or two hundred fathoms, as the case may be. The surface of the reef, when exposed, looks like a great flat of sandstone, with a few loose slabs lying about, or here and there an accumulation of dead, broken coral branches, or a bank of dazzling white sand. It is, however, chequered with holes and hollows, more or less deep, in which small living corals are growing; or has, perhaps, a large portion always covered with two or three feet of water; and here are fields of corals, either clumps of branching madrepores, or round stools and blocks of other polyps, both dead and living.



CORAL, WITH POLYPS.

Proceeding from this central flat towards the ridge, living corals become more and more abundant; as we advance towards the windward side, we encounter the surf of the breakers long before we can reach the extreme verge of the reef; and among these breakers immense blocks are seen, often two or three yards or more in diameter, lying close on the reef. If the lee edge of the reef is approached, it will be seen covered with living corals, all glowing with rich colours, bristling with branches, or studded with great knobs and blocks. Where the slope is gentle, the great groups of living corals and intervening spaces of white sand can be still discerned through the clear water to a depth of forty or fifty feet, beyond which the water recovers its usual deep blue. A coral reef, therefore, is a mass of inert matter, living only at its outer surface, and chiefly on its lateral slopes.

It is very remarkable that in each of the islands of the Pacific, and opposite the large valleys, through which a stream of water falls into the ocean, there is usually a break or opening in the line of reefs that surrounds the shore—a happy provision for the ingress and egress of vessels. Whether the currents of fresh water, constantly flowing from the rivers to the ocean, prevent the tiny architects from building their concentric walls in one continuous line, or whether in the fresh water itself there is any quality inimical to the increase of coral, it is not easy to determine; yet few openings occur in the reefs which surround the South Sea Islands, excepting opposite those parts of the shore from which streams of fresh water flow into the sea. Reefs of varied, but generally circumscribed extent, are frequently observed within the large outer barrier, and near the shore or mouth of the river; but they are formed in shallow places, and the coral is of a different and more slender kind than that of which the larger reef, rising from the depths of the ocean, is usually composed.

It is also observable, that while these coral reefs, which are generally a mile, and sometimes two miles, from the shore, afford, by their apertures, direct access to the indentations in the coast and the mouths of valleys, they often exhibit one of the most beautiful and sublime marine spectacles that it is possible to behold. The surface of the water within the reef is placid and transparent, while that without is considerably agitated by the slightest breeze, and, being exposed to the wind, is generally raised in high and foaming waves. Thus the coral reefs form the best harbours, and secure to the vessels that enter them a supply of fresh water in equal, if not greater abundance than it could be procured in any other part of the island.

Nor should another fact be disregarded; for not only do these polyps erect their buildings in the form best calculated to resist the action of the ocean, but also as breakwaters to strengthen the weakest parts, and those from which the greatest danger is to be apprehended. Thus Captain Beechey, speaking of Ducies Island, describes it as taking the shape of a truncated cone, with the face downwards, and then says: "The north-eastern and south-western extremities are furnished with points which project under water with less inclination than the sides of the island, and break the sea before it can reach the barrier to the little lagoon formed within it. It is singular that these buttresses are opposed to the only two quarters whence their structure has to apprehend danger—that in the north-east, from the constant action of the trade wind, and that on the other extremity from the long rolling swell from the south-west so prevalent in these latitudes; and it is worthy of observation, that the barrier which has the most powerful enemy to oppose is carried out much farther and with less abruptness than the other."

Well may these amazing facts be endorsed with the words of Dr. MacCulloch: "We have found the masons, but where is the Architect? There can be no building without a supreme, directing mind. If, for example, we take the fan-coral, we find a regular structure commenced in nothing, and terminated. The workmen increase in number as the structure grows; since none can leave his place, each lays but his own stone, ignorant of what his neighbour is doing; yet the produce is a York; and ever a York, it is not a Peterborough.

"In another community it is a Peterborough or a Wells; and the design is not less sacredly preserved. There is here no difficulty so far as a single cell is concerned, or as to the point of dependence in the total structure to which it is attached; it was a necessity, the result of an instinct. But where is the instinct that constructed the design—constructed the fan-coral, and not another? It is not the consultation of the workers, for they cannot consult; there is no individual polyp to claim the command; the animal which commenced the work has been dead long since; and what remains to be done is as different from what preceded as is the portico of a Peterborough from the original Norman structure.

"We have still, then, to seek the Architect, the mind which not only planned the pattern, but causes all these blind workmen to execute it, and every one also to perform his own peculiar and precise work, and no other; and this, in thousands of separate structures, and in tens of thousands of successive and similar ones, never varying from the pattern first established. There *is* One who is the Architect, and there can be none other. One Mind unites the discordant and multifarious actions of each one act of millions of agents into one design. One Intellect planned, and One Will executes."

Dr. Landsborough relates not only a singular but successful experiment by Mrs. Marshall, a lady of his acquaintance. Pondering on the formation of rocks, and being a chemist, she resolved to see if they could be constructed artificially. She observed that many had been formed by stratification; some at the bottom of fresh-water lakes, and others in estuaries, or at the bottom of the sea. What, then, must have been the component parts of the latter—of limestone, for instance? They are full of the organic remains of various creatures, who extracted carbonate of lime from the waters, and built their houses of this substance. As these shelly abodes, and the dwellings of coral-like beings, would often be broken in pieces and ground into powder, these fragments, subsiding from time to time, would form strata of calcareous mud—the graves of various marine animals, having intermixed immense masses of sea-weeds, torn by storms and currents from the submerged rocks. And as these hardened in process of time, and became solid stratified rock, great convulsions would upheave them, and bring them within the reach of man.

As, then, it was evident that both animal and vegetable matter were copiously mixed in the soft mass converted into rock, the question arose in this lady's intelligent and sagacious mind—"May not such substances be in a manner necessary to the formation of rocks? and if I can hit on the right proportions, may I not form, in my little laboratory, some miniature resemblance of those mighty masses?" With diligence and zeal she set to work, mixing carbonate of lime with different proportions of these substances, until she discovered the right proportion by which she could form artificial rocks of the firmest texture. Nor did she rest here, but seeing that she could form a cheaper and superior substitute for lath and plaster and ornamental cornices—one harbouring no vermin, impervious to damp, and greatly lessening the risk of destruction by fire—she took out a patent for it under the name of *Intonaco.*

After many experiments by Priestley, De Candolle, and Daubeny, Mr. Ward, greatly to his honour, proposed to increase the purity of the air in large towns, by planting trees, and cultivating flowers in rooms, that the animal and vegetable respirations might counterbalance each other; the plants being fed by the carbonic acid given out by animals, and the blood of animals being purified by the oxygen given off by the plants. In 1837 he communicated a paper on the "Growth of Plants in Closed Cases" to the British Association, and directed their attention to animal life on the same principles. Subsequent efforts of Mr. Warington and Mr. Gosse led to the formation of a marine aquarium, one of which has for some years been exhibited in the gardens of the Zoological Society.

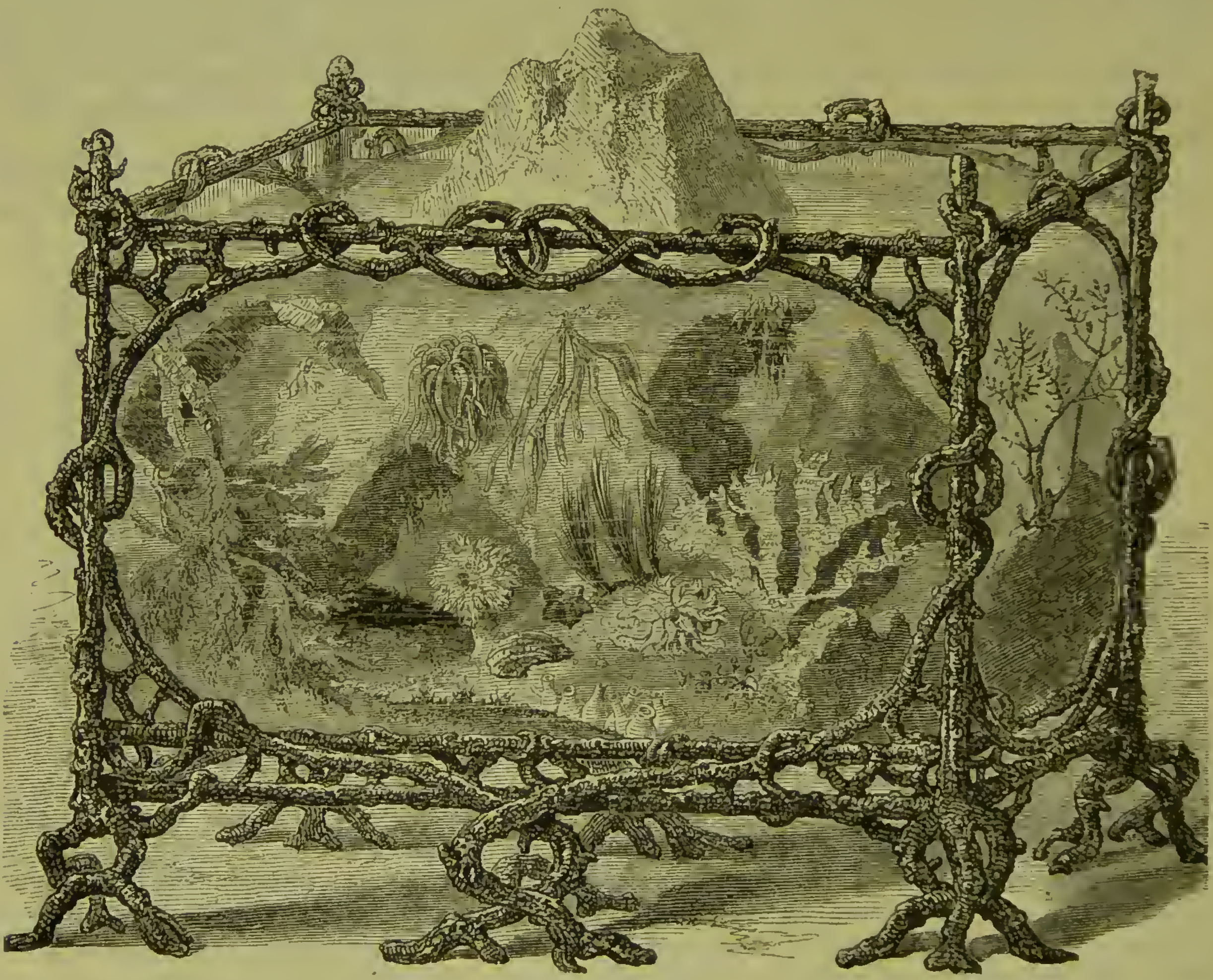
It is natural to wish to have, and to offer to others, some memorial of a pleasant sea-side visit. Stones set in rings, sea-weeds tastefully arranged, and shells in an endless variety of form and hue, have often been employed in this service. To take away living creatures in sea-water is only a recent device, but one that promises to blend with gratification many advantages.

AQUARIUM OF SEA WATER, OR SEA WATER BASIN. GARDENS OF THE ZOOLOGICAL SOCIETY.

A simple earthen jar, easily procured, may be the provisional depôt, to be in due time covered with an oilskin, or a cover which may be screwed on, after the living specimens have been placed in sea-water, of which it is to be about two-thirds full. Then let an effort to stock it be made, by going down at low spring-tide to a ledge of rocks, and with a hammer and chisel breaking off some stones on which some sea-weeds are growing. Two kinds, alike desirable, may be attained throughout the year—the Sea Lettuce, *Ulva latissima*, and *Enteromorpha.* Anemones of various kinds may be safely brought home from the sea-side merely wrapped in sea-weed, if no vessel is within reach. These are especially desirable, and of them a variety may be easily procured. To these, madrepores, corals, and serpulæ may be added; and if then a coralline, a prawn, a little hermit crab, and a few small fish are procured, there will be a sufficiency for a first experiment. Carefully then fastening down the treasures you have gained, they will travel safely to London, or to any other locality.

Now you have reached home, you may arrange for setting up your *Vivarium.* We prefer that name for it, to its being called an *Aquarium;* the latter denoting merely a vessel of water, while the former shows it is one to contain living things. The compound phrase, *Aqua-Vivarium*, is too long for ordinary use. Suppose not that at this juncture great difficulty will necessarily arise. A bell-glass, such as gardeners use, with its knob fixed into a stand of wood or earthenware, will answer the purpose. So far from seeking one that is cylindrical, for this will be too fragile, look out for one that tapers towards the apex—a much stronger form; and then, as its diameter should not exceed sixteen inches, for otherwise it will be in danger of breaking, a few shillings will defray the cost.

Do you wish for something more showy? Tank-makers, easily accessible, will show you some with all the latest improvements. They will tell you that zinc will do for a fresh-water vivarium, but that an iron or brass frame, with the glass so fitted to it as entirely to cover the metal before the cement is applied, is best for marine creatures. Let us suppose, then, the vessel to be placed on a table. The base should be covered with sea-sand and small pieces of gravel, a miniature resemblance of a shingly beach. Boulders and pieces of stone, kept for some time in salt water, may now be reared into artificial rocks; and on these should be placed the growing sea-weeds. Recesses and caverns, too, should intersect your fabric, not only for the sake of the picturesque, but also for some of the living creatures, who will like to hide in them. The anemones will find an eligible locale on any jutting where they can be best seen; so will the serpulæ; the other contents of your jar will provide for themselves as soon as you have poured in the sea-water.



THE VIVARIUM.

"Alas!" do you say, "the vessel was broken during the journey, and the creatures are lost!" Artificial salts may easily be obtained, according to Mr. Warington's formula: sulphate of magnesia, $7\frac{1}{2}$ oz.; sulphate of lime, $2\frac{3}{4}$ oz.; chloride of sodium, $43\frac{1}{4}$ oz.; and chloride of magnesia, 21 grains. These quantities will make ten gallons of artificial sea-water. Sea-water, however, contains innumerable germs of life, which artificial water cannot; and, of course, this is a disadvantage. A little glass bubble, easily procurable, is desirable, to show, by its floating, the specific gravity of the water. That of sea-water averages about 1·025, and when, from evaporation, the water you have exceeds this, a little rain, or distilled water, may be added, to restore its original density. Living sea-weed and animals may also be readily procured.

To prevent a green vegetation obscuring the glass of the vessel or tank, the common periwinkle may be employed, for it has a ribbon-like tongue, provided with flinty teeth, which it will use as a scythe cutting down grass, to clear away the undesired growth; but on the failure of this creature, or of the planorbis, or other species of fresh-water shells, a piece of rag tied round one end of a stick will prove to be effectual. Should any creature die, it must be immediately withdrawn, or there will be a most offensive odour. Too much light should be avoided by blue stained glass, or by coloured blinds of the same colour, or one slightly tending to green. The heat of a vivarium should resemble that of the sea, and range from 45° to 75°. Small particles of raw meat dried in the sun, and moistened when used, or mussel, cockle, or raw fish pulled into small pieces, will be found appropriate for food. No more should be given to any creature than it can receive at once; any remains should be transferred to another, or removed from the tank.

Go, now, to your vivarium. Look! and you will see numbers of minute drops forming on every plant, and even where the tiny vegetation is beginning to grow on the stems, and then rising rapidly to every part of the surface, so long as the rays of light are uninterrupted. Of what, then, do these globules consist? Of pure oxygen, which the light enables the plants to give forth, while they feed on the carbonic acid given out by the animals; thus the two respirations counterbalance each other. Repeated visits will yield numerous illustrations of the habits and instincts of creatures already described.

Thus, with an anemone before you, with its petals put out, if you place a small water-insect, or piece of meat, within reach of one or two of the outer tentacles, you will see that they adhere to it as by a kind of electric effect, and there is an agitation among a few tentacles in its immediate vicinity, which bend towards the object and try to reach it, in support of those which first had hold of it. Meanwhile, a further purchase is obtained by those tentacles which touched the morsel first, till it is completely surrounded, and, if living, overpowered. It is passed along, in fact, from one tentacle to another, as with us it would be from hand to hand, until it coils over towards the mouth, into which it is soon sucked, and disappears. A gentleman, known to the writer, looked one summer evening at his vivarium before leaving home, and noticed a small but voracious fish swimming about with its utmost activity. On his return, he looked again; but the fish could not be seen. He searched the vessel narrowly, but it still escaped his notice. When examining particularly a fine sea-anemone, he could just perceive a small part of the tail of the little fish protruding from the centre of the disc; the energetic creature having become a victim of the animal flower.

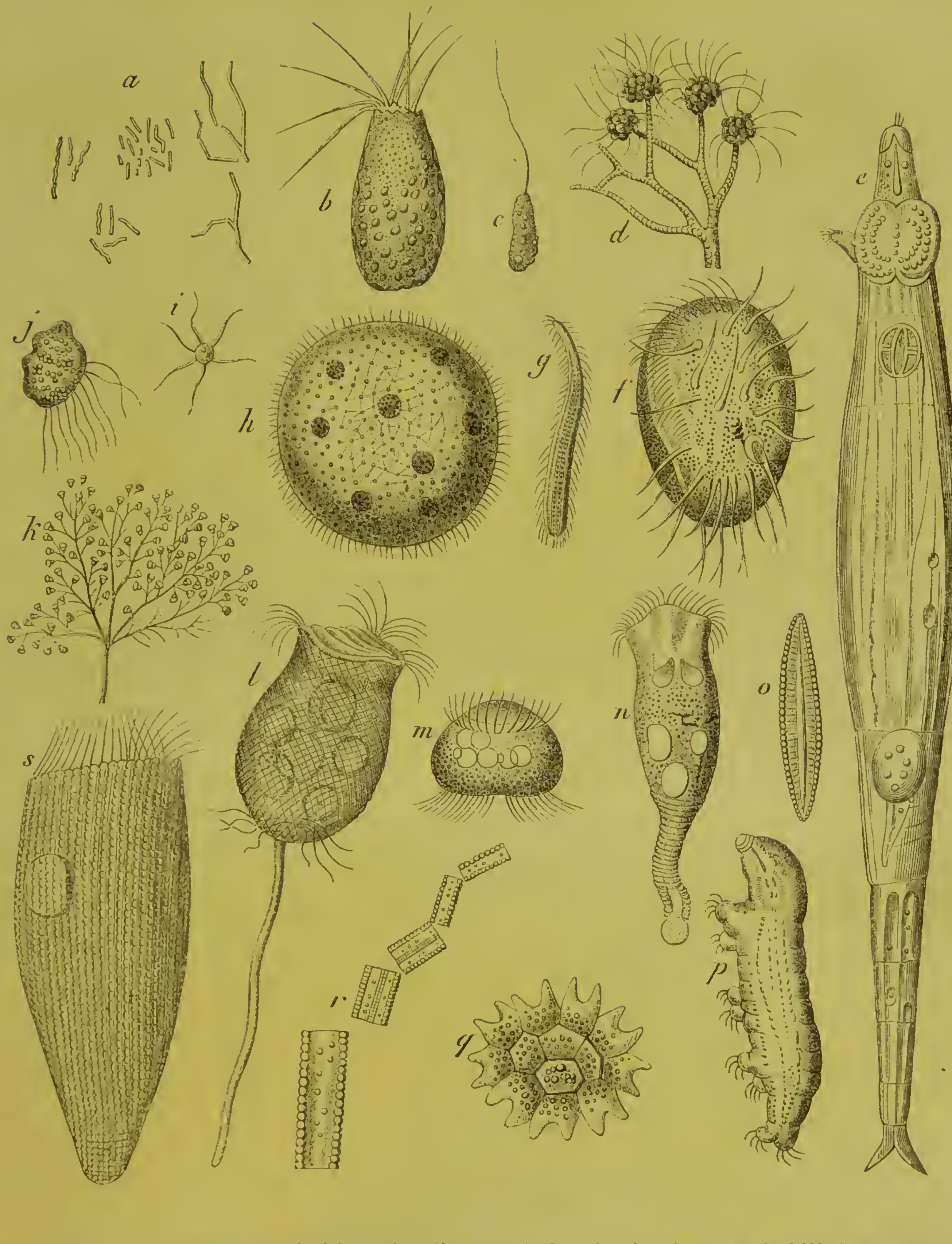
When no food is given to the anemone, and it becomes hungry and dissatisfied with its situation—as often happens with the *Dianthus*, or Pink—it will probably turn its stomach inside out, as if, like the man who does so to his pocket in the presence of his creditor, it would say, "See! there is nothing here!" When, however, a kind of transparent bladder, delicately ribboned, appears, astonishing the spectator, it is a proof that the anemone is starved, and starved to its death.

Mr. Warrington had an *Actinia mesembryanthemum* with a double head, both heads being on the same plane. The body seemed to be entirely one, with an oval basal disc, and no sign of separation up to the very edge of the leathery covering, but the upper disc consisted of two complete circles, each surrounded by its proper set of tentacles, and each provided with a central mouth. On presenting a considerable morsel of food to an ordinary *Actinia*, some slight agitation may be observed even among the most remote tentacles, as if they were, in some degree, conscious of what was going forward, and held themselves ready to give assistance, if required. But Mr. Warrington was accustomed, in the instance referred to, to feed first one and then the other. When the morsel was brought near the tentacles on the outer part of one circle, and they were busy securing it, the other tentacles of that circle showed some degree of alertness, but not a feeler of the other circle stirred. Here, then, the duality was apparent; and, still further, when the twin head received its morsel, both might be observed independently engaged in securing and devouring the meal.

Foreigners boil many kinds of *Actiniæ* for the table, and find in them a very pleasant dish. In texture it is something like calf's-foot-jelly, the taste and smell resembling that of crab or lobster. Eaten with sauce, they are savoury. Mr. Gosse gives an amusing account of the manner of his first becoming acquainted with Actinian dainties. "As it was an experiment," he remarks, "I did not choose to commit my pet morsels to the servants, but took the saucepan in my own hand. As I had no information as to how long they required boiling, I had to find it out for myself. Some I put into the water (sea-water) cold, and allowed to boil gradually. As soon as the water boiled, I tried one; it was tough, and evidently undone. The next I took out after three minutes' boiling; this was better; and one at five minutes was better still, but not so good as the one which had boiled ten. I then put the remaining ones into boiling water, and let them remain over the fire boiling for ten minutes; and these were the best of all, being more tender, as well as more inviting in appearance. I must confess that the first bit I essayed caused a sort of lumpy feeling in my throat, as if a sentinel guarded the way, and said, 'It shan't come here.' This sensation, however, I felt to be unworthy of a philosopher, for there was nothing really repugnant in the taste. As soon as I had got one that seemed well cooked, I invited Mrs. G. to share the feast; she courageously attacked the morsel, but I am compelled to confess it could not pass the vestibule; the sentinel was one too many for her. My little boy, however, voted that 'tinny was good,' and that 'he liked tinny,' and loudly demanded more, like another Oliver Twist. As for me, I proved the truth of the adage, *Ce n'est que le premier pas qui coûte;* for after the first defeat my sentinel was cowed. I left little in the dish." Afterwards, frying them with egg and bread-crumbs, they were found far superior to the others; "all prejudice yielded to their inviting odour and appearance, and the whole table joined the repast with evident gusto."

Active, fearless, and powerful as the *Actiniadæ* are in the means adopted to secure their food when it comes within their reach, they are but sluggish creatures, and show but little instinct in their general habits. They will remain for hours, and even days, in the same position; and when they do move, it is at an almost imperceptible pace; perhaps an inch in an hour. When removed from their site and placed at the bottom of a vessel, they take a good while to consider whether they shall fix themselves on another; and a still longer time in effecting their purpose. When on the look-out for prey, as they never lengthen their tentacles, they do not reach it unless it come in actual contact with them. Dr. James Hamilton, in his little work called "Life in Earnest," has happily seized on this apparent laziness of the zoophyte in rebuking those who are satisfied with living in the world without a definite object:—

"Those of you who are familiar with the shore, may have seen attached to the inundated reef a creature, whether plant or animal you could scarcely tell, rooted to the rock as a plant might be, and twirling its long tentacula as an animal would do. This plant-animal's life is somewhat monotonous, for it has nothing to do but grow and twirl its feelers, float in the tide, or fold itself on its footstalk when that tide has receded, for months and years together. Now, would it not be very dismal to be transformed into a zoophyte? Would it not be an awful punishment, with your human soul still in you, to be anchored to a rock, able to do nothing but spin about your arms or fold them up again, and knowing no variety, excepting when the receding ocean left you in the daylight, or the returning waters plunged you in the green depths again, or the sweeping tide brought you the prize of a young periwinkle or an invisible star-fish? But what better is the life you are spontaneously leading? What greater variety marks your existence, than chequers the life of the sea-anemone? Does not one day float over you after another just as the tide floats over it, and find you much the same, and leave you vegetating still? Are you more useful? What real service to others did you render yesterday? What tangible amount of occupation did you overtake in the one hundred and sixty-eight hours of which last week consisted? and what higher end in living have you than that polypus? You go through certain mechanical routines of rising, and dressing, and visiting, and dining, and going to sleep again; and are a little roused from your usual lethargy by the arrival of a friend, or the effort needed to write some note of ceremony. But as it curtseys in the waves, and vibrates its exploring arms, and gorges some dainty *Medusa*, the sea-anemone goes through nearly the same round of pursuits and enjoyments with your intelligent and immortal self! Is this a life for a rational and responsible creature to lead?"



a. Vibrios, of diverse species, magnified from 300 to 400 times. *b.* Englyphe tuberculeuse, magnified 300 times. *c.* Monad, magnified 600 times. *d.* Artophyse, magnified 300 times. *e.* Common Rotifer, magnified 250 times. *f.* Pleseonie, magnified 300 times. *g.* Tracelius, magnified 230 times. *h.* Volvox globator, magnified 70 times. *i.* Amibe, magnified 330 times. *j.* Spongilles, magnified 350 times. *k.* Arborescent Vorticella, magnified 20 times. *l.* Vorticella of infusions, magnified 750 times. *m.* Urceolaria (seen from the side), magnified 400 times. *n.* Systolide, magnified 300 times. *o.* Navicula. *p.* Tardigrade Systolide, magnified 160 times. *q.* Micrasteries, magnified 600 times. *r.* Bacillaria, magnified 316 times. *s.* Stentor, magnified 150 times.

ANIMALCULES.

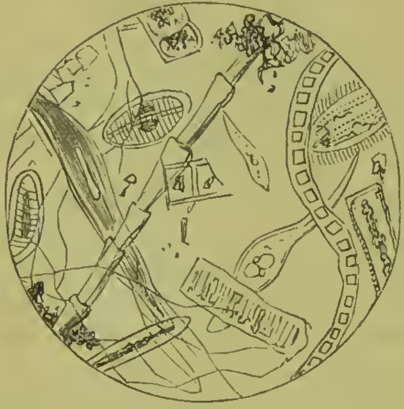
ANIMALCULES is the name which is applied to small animals of various classes, which cannot be distinctly seen without the use of a microscope, as the minute radiate animal of the coral, the worm-like creatures found in paste, vinegar, and vegetable infusions, or the smaller crustacea.

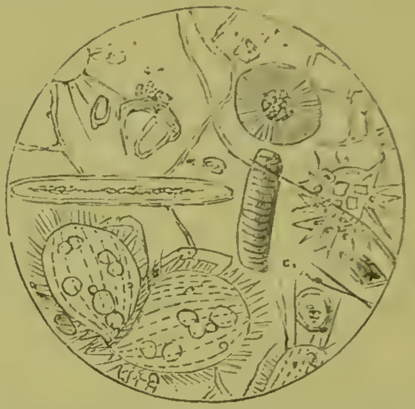
When Dr. Scoresby was sailing in the Greenland seas, he sometimes passed through stripes of blue, green, olive-green, and transparent blue, in the short space of ten minutes. During a run of fifty leagues the sea was constantly of an olive-green colour, remarkably tinted, but on one afternoon it changed to transparent blue. So greatly did this excite his curiosity, that he determined to ascertain the cause, and discovered that the green appearance of the sea in these latitudes is caused by countless millions of small marine creatures. A calculation of their number in the space of two miles square, and two hundred and fifty fathoms deep, gave an amount of 23 trillions, and 888 billions. On one occasion the sea was observed to be coloured in veins and patches of a brown colour, and sometimes with a yellowish-green; and this water, on being examined by the microscope, appeared swarming with minute marine creatures. A drop of this water contained 26,500 animalcules. Hence, reckoning sixty drops to a dram, there would be a number in a gallon of water exceeding, by one-half, the population of the globe on which we live.

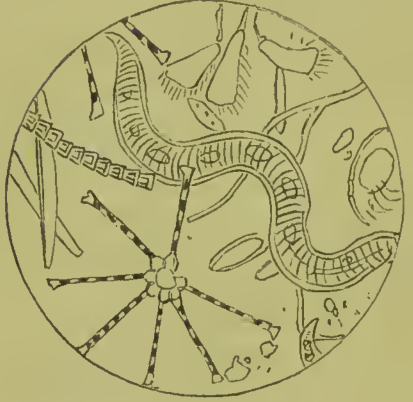
Among those who stand foremost in the list of microscopic naturalists, Professor Ehrenberg takes the lead. It is not only in Europe, but in Asia and Africa that this philosopher has assiduously studied the minute organic productions of Nature; and the results of his persevering researches, during a period of many years, have been recently given to the world, in various scientific publications of great merit, as the matured fruit of deep inquiry. His splendid work, entitled, "*Die Infusionsthierchen als vollkommene organismen. Ein Blick in das tiefere Leben der organischen Natur. Leipzig*, 1838," is a folio volume, with sixty-four plates, containing many hundred figures, coloured from nature. Whether we consider the marvellous beings it exhibits, the talent, knowledge, and labour required for their successful examination, or the skill in actually picturing them to the eye, the work demands our highest admiration. No one who has not seen this work can have an adequate idea of the almost endless diversity of form and structure which animal existence assumes, as disclosed to us by microscopic examination.

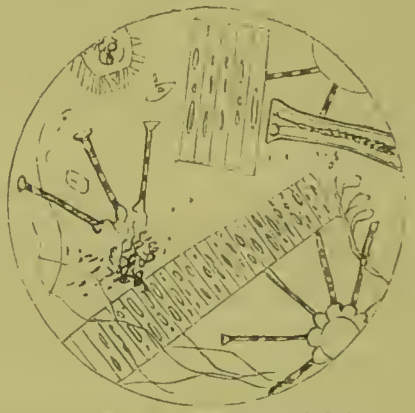
If you put a drop of sour paste in water, or put a bunch of some sort of vegetable, as hay or sage leaves, into water, in a short time it will contain thousands and sometimes millions of infusoria. The more beautiful kinds of animalcules, however, are to be met with in pools or in ditches of running water. Oftentimes in ponds the stems of plants will appear covered with a sort of mucus or slime. This appearance is owing to an extensive colony consisting of innumerable animalcules. The thin, shining film which sometimes covers plants in pools of water, assuming the varied hues of red, brown, yellow, green, and blue, is made up also of these creatures. Some species inhabit the clear fresh water of lakes and rivers. Others live in the briny ocean. When sailing on the ocean at night, the voyager has often looked, as we have done, over the side of the vessel, and has beheld sparkles of light shining beautifully in the spray. To this phosphorescence many species of medusæ contribute; by repeatedly filtering water taken up fresh from the sea, Professor Ehrenberg was enabled to obtain the phosphorescent animalcules, and observe them under the microscope. The plate of engravings will show some of the forms of these minute beings.

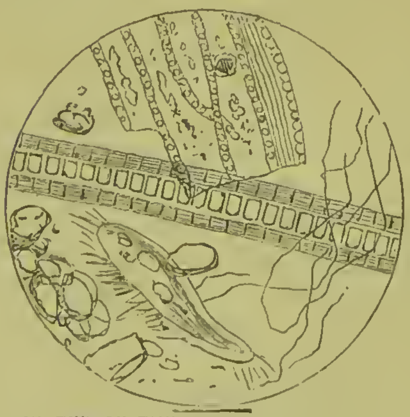
It is a most astonishing fact, that a drop of water on a glass slide, which to the naked eye exhibits but a few minute vegetable fibres, and a small quantity of dust or sand, should, under the microscope, be seen to contain a crowd of animals so curious and beautiful that we can hardly bear to lose sight of them by withdrawing the eye from the instrument. Some are darting through the water with great rapidity, while others are chasing and feeding upon creatures hundreds of times smaller than themselves. Many are attached to a twig of vegetable matter by long delicate threads; several have their bodies inclosed in a transparent tube, from one end of which the animal partly protrudes and then recedes, while numbers are covered by an elegant shell or case. The minutest kinds (the *Monads*), many of which are so small that millions might be contained in a single drop of water, appear like mere animated globules, free, single, and of various colours, sporting about in every direction.

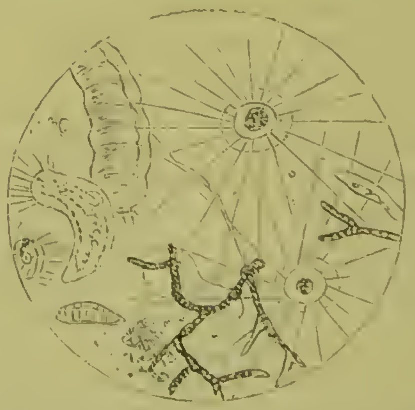

THAMES WATER FROM RICHMOND.


THAMES WATER FROM WATERLOO BRIDGE.


WATER OF GRAND JUNCTION COMPANY.


WATER OF THE WEST MIDDLESEX COMPANY.

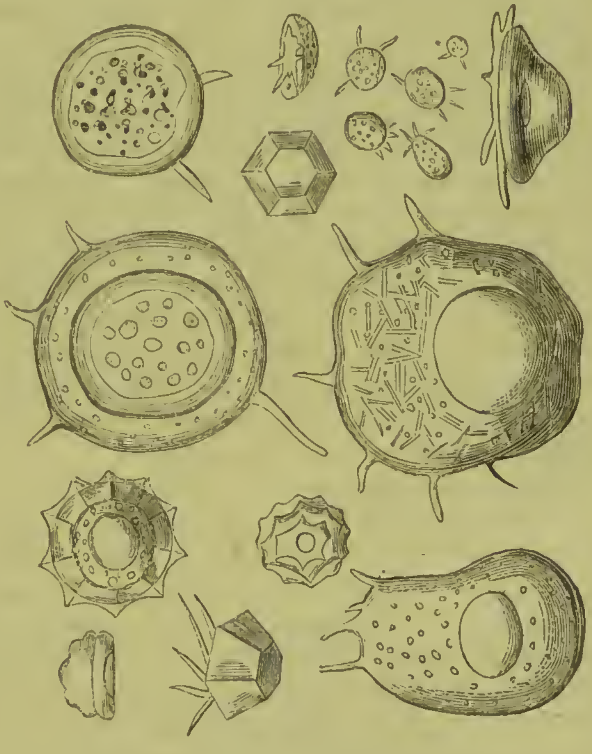

WATER OF THE CHELSEA COMPANY.


WATER OF THE SOUTHWARK AND VAUXHALL COMPANY.

Numerous species resemble pearly cups or vases, fringed round the margin with delicate fibres that are in constant motion (see Plate of Animalcules, opposite p. 323, fig. *l*). Some of these are attached by spiral tendrils; others are united by a slender stem or stems (fig. *k*) to one common trunk, or appearing like a bunch of hare-bells; others are of a globular form, and grouped together in a definite pattern on a tubular or spherical membranous case for a certain period of their existence, and ultimately become detached and locomotive; while many are permanently clustered together, and die if separated from the parent mass. No organs of progressive motion, similar to those of beasts, birds, or fishes, are observable in these beings; yet they traverse the water with rapidity, without the aid of limbs or fins; and, though many species are destitute of eyes, yet all possess an accurate perception of the presence of other bodies, and pursue and capture their prey with unerring purpose.

A drop of water, taken from the Thames at Richmond, will be observed; and it will be seen from other specimens, that the lower we go the more impure do the waters of that river become. Water, if it were required to be absolutely pure, would, doubtless, have been provided for us by the All-wise Creator; but as it is, such a result can be obtained only by distillation. Filtration will often render water colourless and pellucid; but it will be obvious, on consideration, that there may be ingredients which it cannot remove.

All microscopic animalcules were once confounded under the name of "infusorial animalcules," because they were found by their first discoverers to abound in water containing vegetable matter, or in infusions of vegetable substances. It is, however, now ascertained that they constitute distinct classes, distinguished by marked organic differences. The minuteness of some is almost inconceivable; under the most powerful microscope, they appear only as moving points, of which a cubic inch of water may contain eight hundred thousand millions, as can be shown by means of the micrometer; and were our instruments capable of still greater refinement, and did they at the same time retain their accuracy, it is probable that creatures far inferior in size would be discovered. Let it not be supposed that we are launching out into any extravagant and baseless assertions; we are detailing facts which have been repeatedly observed; and, incredible and startling as it may at first sight appear, it is proved that a drop of water tenanted by those smallest of animalcules termed *monads* (see Plate, fig. *c*) contains a number equal to that of all the human beings on the globe. In water replete with these *monads*, Dr. Ehrenberg has described species not larger than the thousandth or even the two thousandth part of a line, and which appeared to be separated from each other by intervals scarcely larger than themselves. Such water may almost literally be called alive; it is, indeed, teeming with animation: our minds are overwhelmed by the idea. But each of the *monads* is an organised being, consisting of various parts, and furnished with various instruments; it moves at will, it enjoys existence! Well may we pause, lost in admiration. From the creature we revert to the Creator, whose power is thus marvellously displayed. With Him there is neither great nor little; his hand formed and his eye sees every minute animalcule, as well as all other living things—every atom of matter, as well as worlds or suns. He is all and in all, and his power and his presence are alike boundless.


SHELL, OR SHIELD-BEARING ANIMALCULES.

One class is termed *Polygastrica*, from the circumstance of their possessing a number of internal sacs, which are generally regarded as stomachs, and which are easily seen through the transparent investment of the animals, viewed under a powerful microscope.

THE MANY-STOMACHED ANIMALCULES.

The sacs, in some instances, arise from the mouth itself by separate tubes, and in others they are appended to a kind of intestinal canal, which traverses the body, and terminates either at the extremity of the body opposite to the mouth, as in *Paramecium aurelia*, or which, winding up, terminates in a depression near the mouth, as in *Vorticella* (see Plate, fig. *l*). The sacculi, though distinguishable under ordinary circumstances, are rendered more conspicuous when the animals have swallowed water in which colouring matter is suspended in a state of very minute division, but not chemically dissolved. Trembley, in his investigation of the structure of the *hydra*, adopted this method, and Gleicher attempted it, though unsuccessfully, in his investigations upon these animalcules. The fact is, that many of our metallic or earthy colouring materials immediately poison these creatures, when, of course, the experiment fails. Ehrenberg failed with the indigo and gumlac of commerce, these substances being always contaminated with a slight admixture of white lead, which acts as an instantaneous poison; but experiments with pure indigo, or pure carmine, were successful.

When a minute portion of a very weak solution of indigo is added to a drop of water containing *vorticellæ*, an animated scene ensues. Eager for the food, which they swallow with avidity, they throw the cilia into rapid action, producing in the water currents, which hurry with them the particles of the indigo, in gyrations converging to the mouth. In a short time a number of dark blue circular dots begin to show themselves on the transparent body of the animalcule, which are occasioned by the particles of the indigo accumulating in these situations; they also make manifest the intestinal tube, and their progress can be gradually traced through its extent. It was thus, by a series of experiments, that Ehrenberg was at length enabled to determine the number of the sacs, or stomachs, and the course of the intestinal tube. But it appears that all the sacs are not filled at the same time; many continue long without receiving any particles of colouring matter, and the whole course of the alimentary tube is not simultaneously tinted. The number of sacs thus distinguished amounts to two hundred in some species, in others they are less numerous.

It is on the characters and positions of these sacs, and on the course of the presumed intestinal tube, that Ehrenberg has founded the divisions of this class; but Professor Jones, while he acknowledges that the views of this naturalist are sanctioned by general consent, is not disposed to admit their accuracy in all respects, and states that his own observations (made by means of a compound achromatic microscope, and employing powers nine-tenths, one-half, one-fourth, and one-eighth of an inch focus) have led to very different conclusions. The positions of the orifices for the reception and rejection of aliment he found to be such as Ehrenberg has indicated; but the most patient investigation did not enable him to detect the arrangement of the tube, and the sacculi appended to it, as figured and described by that author. He states that he has never been able to perceive, when one of the carnivorous animalcules has swallowed another, that it has been conveyed, as was to be expected, into one of these so-called stomachs, but that he has traced it into "what seemed a cavity excavated in the general parenchyma of the body." In the next place, he states that these sacculi have no appearance of being attached to any tube, by means of peduncles, or necks; and that in *Paramecium aurelia*, so far from appearing to be connected with a central canal, as is represented by Ehrenberg, they are in continual circulation, moving up one side of the body and down the other, and even changing their relative positions, like the coloured granules visible in the gelatinous substance of the hydra. And, thirdly, he affirms that in no instance has he been able to detect a central tube at all, as depicted by Ehrenberg, much less the branches leading from it to the sacs; and he adds, that the circumstances attending the prehension of food would, in themselves, lead us to imagine a structure different from that described by Ehrenberg. He adduces, by way of confirming his views, the changes of form which these animalcules undergo when devouring prey nearly equal to themselves in bulk, and therefore incapable of entering into one of these sacs; the mouth dilates to engulf the victim, and, when this is swallowed, the whole body, as in the hydra, becomes greatly distended.

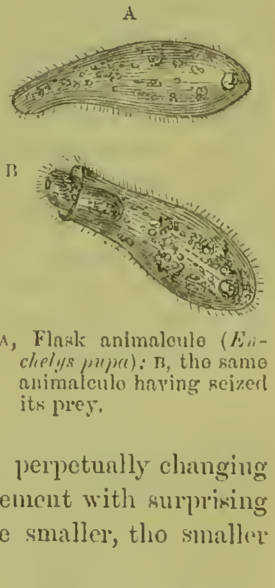
On the other hand, Dr. Mantell says, "Let us try an experiment. I place a drop of a solution of carmine in the water between the plates of glass containing *vorticellæ*. The fluid in which they are floating now appears turbid, and full of gray particles, which are thrown into rapid motion by the vibration of the cilia, and currents are seen passing to and from the mouth of the animalcules. In a few minutes the water gradually becomes clear, and several round spots of carmine are apparent in the body of each of the *vorticellæ.* We have, in fact, caused their little stomachs to be filled with colouring matter, and can now distinguish their number and arrangement. If the body of the animalcule were a mere vase or cup, or a simple cavity, like the digestive sac of the polyp, it is obvious that the carmine must have collected into a single ball or mass; but this is not the case: on the contrary, the colour appears in distinct round spots, from having accumulated in globular cells, and, by careful investigation, the tube connecting these cells may be detected."

These creatures abound in all waters, various species being the tenants of streams, pools, rivers, &c., of which they render every cubic inch absolutely teeming with life. Some species are far more common than others; but the rarer kinds may generally be procured by steeping dried grass or leaves in a vessel of water, and leaving it for a few days exposed to the influence of the sun and air, when the infusion will be found swarming with animalcules. A drop of this infusion, or of water from any pond or ditch, if put upon a thin slip of glass, and covered with any delicate film of talc, and viewed through a microscope of about four, five, or six hundred times magnifying power, and of one-fourth of an inch focus, will then present an astonishing spectacle. A little practice in the management of the instrument, and also of the eye, is necessary; for experience greatly improves the eye in the use of the microscope.

The polygastric animalcules appear, as far as researches have made us acquainted with them, to be divisible into two primary groups; one distinguished by the soft and shelless condition of the body (of which the Flask Animalcule is an example); the other by the body being more or less protected by an extremely fine and transparent shell, which differs greatly in form in the various species; in some it is a simple transparent shield on the back; in others the shell approaches that of a bivalve mollusc.

This shell, or shield (so called because it does not in all cases cover the whole body), is generally composed entirely of silica, or flint; but sometimes it is formed of lime with a portion of iron rust.

Professor Ehrenberg says, "With lime and soda, we can prepare glass out of invisible animalcules." Thus it would not be impossible to manufacture the lenses of a microscope out of the shells of infusoria!



A, Flask animalcule (*Enchelys pupa*): B, the same animalcule having seized its prey.

The forms of these animalcules are as various as the species, and many are perpetually changing their figure at pleasure. All are active, and they dance about in their native element with surprising energy, avoiding each other in their mazy movements, the larger pursuing the smaller, the smaller endeavouring to escape.

In the globular monad, the smallest of known animalcules, no organs of locomotion have been satisfactorily demonstrated; the most powerful microscope fails to detect them, if they exist. M. F. Dujardin, however, asserts that in some he has perceived a few most minute and slender filaments proceeding from their bodies, which he supposes to be locomotive agents; other microscopic observers, however, do not appear to have seen them; indeed, he describes them as so minute and fine (the thirty thousandth of a millimetre in diameter) as to require an instrument of very extraordinary power to present them to the eye.

Professor Owen says:—"The *Polygastric infusoria,* notwithstanding their minuteness, take a great share in important affairs of the economy of nature, on which our own well-being more or less immediately depends.

"Consider their incredible numbers, their universal distribution, their insatiable voracity, and that it is the particles of decaying vegetable and animal bodies which they are appointed to devour and assimilate. Surely we must, in some degree, be indebted to these ever-active, invisible scavengers for the salubrity of our atmosphere. Nor is this all; they perform a still more important office, in preventing the gradual diminution of the present amount of organised matter upon the earth; for when this matter is dissolved or suspended in water, in that state of comminution and decay which immediately precedes its final decomposition into the elementary gases, and its consequent return from the organic into the inorganic world, these wakeful members of nature's invisible police are everywhere ready to arrest the fugitive organised particles, and turn them back into the ascending stream of animal life. Having converted the dead and decomposing particles into their own living tissues, they themselves become the food of larger *infusoria*, as the *rotifera*, and of numerous other small animals, which in their turn are devoured by larger animals, as fishes; and thus a pabulum, fit for the nourishment of the highest organised beings, is brought back by a short route, from the extremity of the realms of organic matter."*

THE WHEEL-BEARING ANIMALCULES.

THE *Rotifera*, or Wheel-bearing Animalcules (see fig. *e*, Plate of Animalcules), are so termed from the appearance of certain wheels often seen rapidly rotating, in various situations on the anterior part of the body near the mouth. We say wheels, because they were so regarded by the earlier microscopic observers, who seeing them rotate, as it appeared, with great velocity, were completely at a loss how to account for their presence and motion, or to conceive the nature of their organic union with the body of the animal itself. It scarcely need be said that the continued revolution of any part or appendage of the body round an axis (as a wheel turns on its axle), is quite inconsistent with the possibility of an organic union of such an appendage to the body; this, indeed, was felt by the earlier observers, yet they saw the wheels of these animalcules whirling round and round, and were unable to solve the enigma which completely puzzled them. Vicq. d'Azyr, M. Dutrochet, and others proposed an ingenious solution of the difficulty; they considered each wheel to be composed of an exceedingly flexible structure, and that, whilst in reality stationary, it became thrown into a series of undulations, or alternate elevations and depressions by the action of muscular fibres; the elevated portion sinking, the sunk portion being raised, and so on in succession with great rapidity round the ring, as wave follows wave: the rapidity of this alternation of elevation and depression, which would certainly produce the appearance of a ruffled stream running along and returning into itself, may, as they suppose, so deceive the eye as to give the appearance of a revolving wheel. It is, indeed, true that the rotation of these wheels is an optical delusion; but, beyond this, it is now proved that there are no wheels at all, and that the appearance of these is produced by circlets of minute cilia or fibrils, while the apparently rotatory motion in question is produced by a series of progressive undulations in consequence of the alternate and orderly extension and contraction of each separate fibril.

According to the observations of Dr. A. Farre, the cilia, under a microscope of high power, present an appearance of waves rolling round and round in a circle; each wave is produced by a number of cilia, those forming the highest point being at full stretch; the others, folded down upon themselves, in an increasing ratio to the middle of the interval between two waves, where they are most completely lowered: these, however, become in turn the most elevated, and those which were the highest the most lowered, and so on in alternate succession, and with great rapidity, the waves appearing to roll onwards.

These cilia are certainly endowed with voluntary motion; they are regulated in their actions by the will of the animal; they can be urged into movements of extreme rapidity, or put into gentle and tranquil action, or stopped in an instant. Sometimes a portion only of the circlet of cilia is in action, while the other portion is quiescent, and sometimes a few cilia alone are seen slowly bending and then stretching themselves; when all at once the whole begin to work with the utmost energy, wave succeeding wave with wonderful velocity. It is by the action of these cilia that the animalcule rows itself through the water, and traverses the tiny ocean in which it revels, full of animation. They are not, however, exclusively organs of locomotion; they serve for the acquisition of food; fixing itself, by means of a pair of forceps, terminating the body, to some stationary object (as, for example, an aquatic plant), the animalcule sets its cilia in action, and thereby produces a whirlpool in the contiguous water, converging to its mouth, and hurrying thither such minute particles, either of an animal or vegetable nature, as are drawn into the mimic *charybdis*. It appears that the cilia of these animalcules, whatever their own structure may be, are governed by a muscular apparatus, which is very conspicuous, and which retracts them, when not in use, within a kind of sheath, where they are safely lodged till their action is required.

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* "Lectures on the Invertebrata," p. 27.

Having thus explained the real character of the supposed wheels, whence this group of animalcules has received its general title, we may proceed to more particular details.

The *rotifera* may be described as shell-covered animalcules, their body being inclosed in an investment, moderately firm or horny, but of extreme delicacy, and very transparent, so that the internal viscera may be perceived through it. The upper or free margin of this shell is often indented, or ornamented with regular projections, and is continued by means of a fine membrane to the bases of certain elevations around the mouth, termed lobes, from which arise the cilia already described. This membranous continuation of the shell does not confine the ciliary apparatus, but permits it to be retracted at pleasure within the shell, by means of muscular fibres, the cilia themselves being drawn into a sheath within the animal's body.

The *rotifera* present great variations of form and colour; but all have at the posterior extremity of the body a pair of forceps or pincers, instruments of prehension, by which they attach themselves at will to stationary objects: in some, as in *Brachionus urceolaris*, these pincers terminate a long muscular tail-like appendage; but in others, as for example *Notommata clavulata*, they terminate a mere projection.

It has been already observed that it is by the whirlpool which the action of the cilia produces, that aliment is brought to the mouth of these rotiferous animalcules. The mouth or oral aperture leads into a gullet, which varies remarkably in size in different species: in some, it is very capacious; but in others, as in *Brachionus urceolaris*, it is a narrow canal. The gullet leads to a gizzard, or preparatory receptacle, in which, by means of a curious apparatus, the food is either ground to pulp or cut in fragments. This apparatus is described by Ehrenberg as consisting of three teeth, which, by the action of the gizzard and of certain muscles belonging to them, work vigorously on each other, and so mince to pieces whatever is subjected to their operation. These teeth are three in number, and consist of one central and two lateral or superior ones: the central tooth is apparently fixed, and has two flattened facets on its upper surface, one for each superior tooth to work upon. Each of these superior teeth consists of two portions, namely, a basal portion, fixed to the walls of the gizzard, and serving for the attachment of muscular fibres, and a free movable portion, which may be regarded as the real tooth, while the other serves as a jaw. These free portions work with their inner edge upon the facets of the central piece, and this edge appears to be jagged or serrated, the better to tear the substances on which it acts. Minute as are these curious organs, the transparency of the *rotifera* permits them to be distinctly seen under a powerful microscope, which also demonstrates their effects upon the bodies of the smaller animalcules on which the various species prey; for, as with fishes, they are the food of each other, and the warfare is perpetually carried on. The hardness of these teeth is not a little surprising; they may be detached from the body of the animalcule in a perfect condition, and be submitted by themselves to examination beneath a microscope; they vary in minor particulars, as form and size, in every species; but their essential characters appear to be the same in all.

From this teeth-furnished gizzard, or preparatory receptacle, a passage, varying in length in different animalcules, leads to the true stomach or digesting cavity, to which the food, after being subdivided, is conveyed. The form and the relative capacity of the stomach, like those of the gizzard, are very variable; but in all these rotiferous animalcules this viscus is furnished with certain appendages, which are regarded as being of a glandular structure, and destined to secrete a fluid essential to the performance of digestion. Ehrenberg considers them as analogous to the pancreas of the higher orders of animals, but without sufficient grounds. Professor Jones, on the contrary, believes them to be the first rudiments of a liver, or biliary apparatus; and we think this opinion much more entitled to assent than that of Ehrenberg: every analogy, indeed, favours it; and we know the liver to be "the most important and the most universal of the glandular organs subservient to digestion." We find an appendix supposed to represent the liver in insects; and in the mollusca and crustacea this organ is extensive, but of a rudimentary structure. In *Brachionus urceolaris* this presumed biliary apparatus consists of two processes united to the upper portion of the stomach; but in *Notommata clavulata* three elongated sacculi are attached to each side of the stomach, and of these the uppermost on each side is the largest. Great, however, is the variation of these appendages, as it respects form, number, and magnitude, in the *rotifera*; but they appear to be always present.

We have already intimated that bands of muscular fibres have been distinctly seen in these rotiferous animalcules: some run longitudinally from the lobes on which the cilia are situated, and are inserted into the membrane lining the shelly covering of the body; these may be termed the retractor muscles of the cilia; but, besides these, others running transversely have been detected. The use of these latter bands of muscular fibres is not clearly ascertained; but it is supposed that, by their contraction, they may act upon the shell to the lining membrane of which they are affixed, so as to make the shell compress the fluid which fills the body of these animalcules (and in which the viscera float), and force out thereby the retracted ciliary apparatus, by averting the membrane connecting them to the shell, which, when the apparatus is withdrawn, becomes inverted, like the finger of a glove, or the horn of a common snail.

Baker, in his "Employment of the Microscope," graphically describes some of these creatures, and his statements may be verified by any intelligent and careful observer:—"If the water standing in lead gutters, or the slimy sediment it leaves behind, has anything of a reddish colour, one may almost be certain of finding the wheel-animalcules therein; and if in summer, when all the water is dried up, and nothing but dust remains, that dust appears red, or of a dark brown, we shall seldom fail, on putting it in water, to disclose multitudes of minute reddish globules, which are, indeed, the animalcules themselves, and which will soon change their appearance; for in the space of half an hour a languid motion begins, the globule turns itself about, lengthens by slow degrees, and becomes in the form of a transparent caterpillar, and appears lengthening out its body at some times, and contracting it as much at others.

"Its motion from place to place is then performed in the manner of such creatures; fixing first its tail, and extending its whole body, then fastening its head, and drawing up its tail to it, and so on, by which it gets along pretty nimbly. But we shall often see it changing this appearance in an instant, and assuming a form extremely different; for its snout being pulled somewhat inward, the front end becomes clubbed, and immediately dividing, exhibits most surprisingly to view a couple of semi-circular instruments before unseen, round the edges of which many little *fibrillæ* (cilia) move themselves very briskly, sometimes with a kind of rotation, and sometimes in a vibrating or trembling manner. An opening or mouth also appears in the middle, between the two semi-circles.

"When in this condition the animal is often seen to unfasten its tail, and swim along with a great deal of swiftness, seemingly in pursuit of prey. When the fore part of the creature first appears to open or divide, the instruments above described—which, when fully protruded, resemble a pair of wheels having a quick rotation, coming then but a little way beyond their tubular cases, and being in that condition like round pieces of paper folded in the middle, or funnels whose sides are flattened almost together—seem only like a couple of semi-circular parts, about the edges whereof what are seen afterwards like the teeth of wheels appear only as little spicula, having a nimble and continual vibrating motion upwards and downwards, whereby the water becomes greatly agitated, and is brought to the animalcule from several times the distance of its own length. As the creature is capable of thrusting out these wheels or drawing them in, as snails do their horns, the figure of them is different in their several degrees of extension or contraction, or according to their position to the eye of the observer."

Some, as the Proteus, belonging to the naked group, form for themselves locomotive organs at pleasure, and are thus perpetually exhibiting changes of figure. These temporary oars are produced by the animal shooting out processes, or finger-like appendages, from different parts of its semi-fluid body, which are retracted, or which sink down at will, others being again protruded.

Some of these animalcules, again, are furnished with jointed bristle-like appendages, which are movable, and by their action propel the beings along; and, in addition, some have little hooks, which enable them to stick to other bodies, as in the *Euplæa charon.*

Others again, and by far the most numerous, have vibratory fibrils, or cilia, as locomotive organs, either disposed on parts of the body, or distributed universally over its surface; their action is supposed to be circular, or, in other words, they are believed to sweep round and round, and they produce a tremulous and very perceptible current in the contiguous fluid, as they thus propel the body onwards.

In some species, as the *Parmecium aurelia* and others, these cilia are regularly arranged so as to encircle the body; but in most they only encircle the oral aperture, or are ranged in its vicinity, and besides acting as organs of locomotion, are agents in the acquisition of food; they produce by their incessant vibration a current in the water, converging to the mouth, and hurrying along with it either smaller animalcules or minute portions of vegetable matter, on which the creatures feed, and which, but for this singular provision, they could not otherwise obtain.

Naturalists have often some difficulty in ascertaining whether a minute object belongs to the animal or vegetable kingdom. So gradually do these divisions of Nature blend with each other, that no one can certainly tell where vegetable life ceases and animal life begins.

In some of the vegetable matter (*Conferræ*), which forms green slimy patches in standing water, the reproductive organs consist of little green grains which fill the transparent tubes of which the plant is composed. When these are ripe, they leave the tubes, and have a motion so much like animal life, that in that state they have been taken for animalcules. In the green Ditch-laver (*Ulva bullata*) these microscopic grains have a very rapid movement, as if chasing each other. In time two approach, and touch one another, then retreat, touch and retreat again: then four combine to execute the same movement; and at last the whole party, thus grouped in forms, dance together in seeming confusion. After a time the motion ceases, and they form the new substance known as *Ulva*.

From this account it will be easily seen how difficult it must be to classify and arrange some of these minute parts of creation. With very many animalcules, indeed, no difficulty can possibly exist. They present so many clear evidences of sensation and voluntary motion, as to leave no doubt upon the mind as to their real place in the catalogue of Nature.

The *Desmidiceæ*, however—a group of minute beings formerly classed by Professor Ehrenberg among animalcules, in the family *Bacillaria* (or Stick Animalcules)—have been regarded by other observers as belonging to the vegetable kingdom. They form very conspicuous objects in nearly every drop of water taken from a stagnant pool. They are, like other plants, of a green colour, and are formed of vessels or cells containing a green substance. These cells, or joints, separate either partially or completely; some genera forming long filaments by the union of many cells, and others appearing only in pairs.

The long, pale, green filament, which we sometimes observe, is a species of the genus *Desmidium*, or chain-wanded animalcules of Ehrenberg, and is formed by a number of cells which are triangular and flat. Another species, having four sides (*Desmidium quadrangulatum*, or Quadrangular Desmidium), is more rare. The flat, oval, or roundish form, toothed at the edge, besides having deeper divisions, is called *Micrasterias denticulata*, or Toothed Micrasterias. The genus to which it belongs (*Micrasterias*, or Little Star Animalcules) has all its species round and flat, deeply divided into two lobed segments or cells, notched, or cleft at the edges, and sometimes even rayed (see Plate of Animalcules, fig. *q*). The mode of increase is remarkable: the two segments are united by a narrow band or tube, which produces two new minute segments, that gradually increase, and separate the two original portions, each of which takes one of the newer formations with it. This singular process is constantly being repeated.

The *Euastrum*, or Star Disk Animalcules, somewhat resemble the last genus, but the species are more oblong in form, and have circular protuberances on the surface. *Euastrum oblongum* is common in pools.

In the genus *Cosmarium*, the segments are more or less round, and neither toothed nor rayed at the edge. The species *Cosmarium margaritiferum* is rather abundant. One, covered with short spines, each spine having several points, is a species of *Xanthidium*, or Double Bar Animalcules. Another, the *Arthrodesmus convergens*, has a single spine on each side of a segment. The spines in this species curve towards each other. *Arthincus* has the spines diverging outwardly, and the ends truncated. The genus *Staurastrum* appears at first view to differ very little from the last.

The finger-like object in the middle of the drop in the plate is a species of *Closterium*, or Spindle Animalcules, which is an interesting and striking genus. There are about twenty species. *C. acerosum*, or Needle-shaped Closterium, is a very pretty object; bright, green, and very slender in form. *C. moniliferum*, the Pearl or Necklace-bearing Closterium, is rather crescent-shaped, with a line of transparent dots down the middle. *C. Dianæ*, or Bow-shaped Closterium, is quite crescent-shaped, small and slender. *C. setaceum*, the Bristle-shaped Closterium, is perhaps the most beautiful. It is very slender in the centre, the ends tapering into long beaks and rather curved, which give it an elegant form.

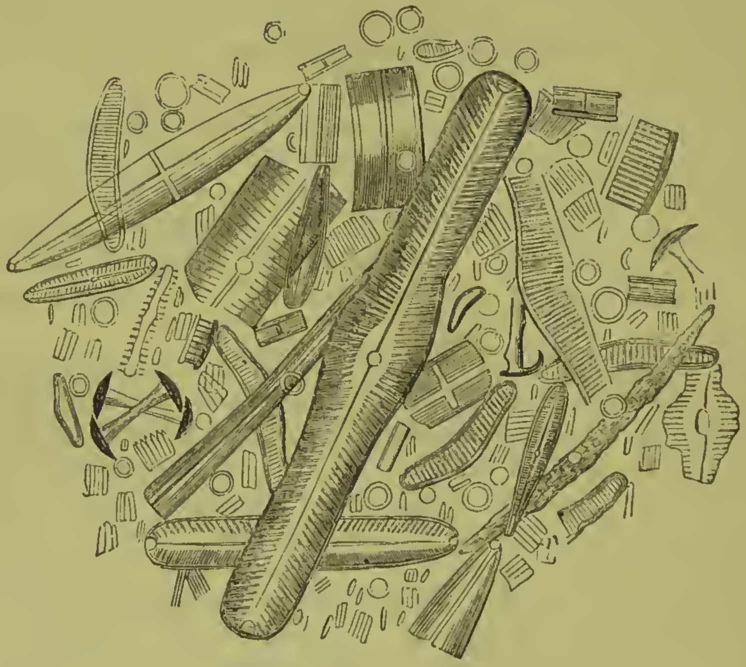
Spirotænia greatly resembles *Closterium* in size and general form; but it is easily distinguished by the green matter forming a spiral line from one extremity to the other; there is no mark of division in the centre, and the ends are round.

Occasionally may be seen very minute bundles of green objects, like little faggots; these belong to the genus *Ankistrodesmus*, and there is but one species, *Falcatus.*

The next genus, *Pediastrum*, is composed of many species, all being more or less like a star; they are formed of several little cells, four or more united together either in a single or double circle.

Scenedesmus comprises little objects composed of from two to ten minute cells, arranged in a row, instead of in a circle, as in the last genus. The second section of the family *Bacillaria* are indicated by the term *Naviculacea.* Ehrenberg, and many other naturalists, have regarded them as undoubtedly belonging to the animal kingdom. Dr. Meyen, however, regards such a classification as of doubtful propriety. He seems inclined to refer the whole of this matter to the vegetable world.

The genus *Navicula*, or Little Ship Animalcules (see Plate, fig. *o*), is so called from the resemblance of the individuals, both in form and motion, to a little boat. The species are very numerous, and many of them are found in a fossil state. The bright colours and delicate markings of the lorica, or shield, which is siliceous, or flinty, make these objects very attractive. Some of them serve for test objects for the highest powers of the microscope; their dotted or striated appearance being often difficult to observe.



SILICEOUS MICROSCOPIC ANIMALCULES.

The *Gallionella*, or Box-chain Animalcules, are a very singular genus. The lorica, when lying on its face, resembles a coin. One species, *G. ferruginia*, or Rust-like Gallionella, is found in chalybeate or iron-containing waters, and where it abounds is often taken for precipitated oxide, or rust of iron.

Ehrenberg discovered the real genus of fungi and mould, and proved that from these new mould and fungi could be raised; rendering it probable that all that unexpectedly appeared were due to germs afloat in the atmosphere. It was shown, indeed, that thousands of millions of these germs may float about, and, even when closely aggregated, look so minute that they are only like a puff of thin smoke. The ova of the *infusoria* and *rotifera* also may dry by countless millions, and be floated about amongst the fine dust, from the bed of dried-up ponds or pools; and, considering their inconceivable numbers, it is difficult to suppose that the atmosphere can ever be free from them.

In most instances the ova escape by the bursting and death of the parent. Owen remarks:—"The sending forth of countless ova through the fatal laceration or dissolution of the parent's body, is most commonly observed in the well-fed *Polygastrica*, which crowd together as their little ocean evaporates; and thus each leaves, by the last act of its life, the means of perpetuating and diffusing its species by thousands of fertile germs. When the once thickly-tenanted pool is dried up, and its bottom is converted into a layer of dust, these inconceivably minute and light ova will be raised with the dust by the first puff of wind diffused through the atmosphere, and may there remain long suspended; forming, perhaps, their share of the particles which we see flickering in the sunbeams, ready to fall into any collection of water, beaten down by every summer shower into the streams or pools which receive or may be formed by such shower; and, by virtue of their tenacity of life, ready to develop themselves whenever they may find the requisite condition for their existence."*

Some animalcules increase by buds, sprouting from the outer surface of the parent; these gradually assume their proper form, throw out cilia, become detached and independent, and shortly after, attaining their full growth, give rise to the buds of another race. So it is with some other creatures. A small bud shoots forth from some part of the parent body of the green hydra, and gradually enlarging, appears like a minute animal of this kind. Strange to tell, a portion of the food digested by the parent has been observed to pass into its body, but no sooner are its arms sufficiently strong to capture prey, than it contributes, in some degree, to the support of its parent. But on being equal to an independent life, it detaches itself and lives alone."

In the monad a division takes place, into portions, each one or more becoming a perfect animalcule.

A *Leucophrys* may be seen full of life and activity, but suddenly it stops short and appears fastened to the spot. After a few half turns on its axis, and a few convulsive starts, it becomes increasingly worth observing. Its anterior and posterior extremities are rounded; between the two a constriction appears, as if a thread had been cast around it and suddenly tightened, and it goes on till, like a human waist sometimes, the animal is almost cut in two. A struggle or two, and at what was the tail end a mouth appears, the division is complete, and the one *leucophrys* has become two.

INCREASE OF A MONAD.
A B, Monads.

The *Convallaria* resembles a bell-shaped flower, supported on a slender footstalk, by which it is attached to fixed objects. The bell first increases in circumference, and begins to divide at its margin; the fissure gradually extends to its base, and when it is complete, one half, in a perfect state, remains on the footstalk. The other half now becomes detached, loses its marginal cilia, but retains those at its base, and so it swims about. As yet, however, it has not thrown out its footstalk; this it gradually does; the adult stage is then reached, when, fixed to some body, it becomes prepared by self-division to be the parent of others.

The *Gonium pectorale* consists apparently of four larger globules and twelve smaller ones; when it is mature it splits into four symmetrical parts, which very soon supply their full complement of globules, and divide again in like manner. Still more remarkable is the *G. pulvinatum*, which appears like a square bit of membrane, divided by lines into sixteen smaller squares; and at these lines the animal divides into sixteen others. It has been estimated even that a single *paramacea* will produce the inconceivable number of 268,435,456 new beings in the course of a month. Another instance is mentioned in which a single individual only is calculated to produce 170 billions of animalcules in four days.

A representation will be observed of the *Volvox globator* in Plate of Animalcules, fig. *h*; and the transparency of this living globe, which is of a delicate green, permits the germs it incloses, moving about in ample space, to be readily seen. When they have attained their proper growth, the outer skin of the parent bursts, and the germs emerge to another state.

The increase of other creatures have marked and astonishing peculiarities. Mr. Gosse thus describes a creature about $\frac{1}{120}$th of an inch long:—"You see a flat area of clear jelly, of very irregular form, with sinuosities and jutting points, like the outline of some island in a map. A great number of minute blackish granules and vesicles occupy the central parts, but the edges are clear and colourless. A large bladder is seen near one side, which appears filled with a subtle fluid. But while you gaze upon it, you perceive that its form is changing, that it is not at two successive moments of the same shape exactly. This individual, which, when you first looked at it, was not unlike England in outline, is now, though only a few minutes have passed, something totally different: the projecting angle that represented Cornwall is become rounded and more perpendicular; the broken corner, that we might have called Kent, has formed two little points, up in the position of Lincolnshire; the large bladder, which was in the place of the eastern counties, is moved up to the Durham coast, and is, moreover, greatly diminished. Lo! while speaking of these alterations, they have been proceeding, so that another and a totally diverse outline has been presented. A great excavation takes the place of Dorset; Kent is immensely prolonged; the bladder has quite disappeared: but it is impossible to follow these changes, which are ever going on, without a moment's intermission, and without the slightest recognisable rule or order." Yet this creature has offspring, in due course, to play the same fantastic tricks as its parent.

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* "Infusorial Animalcules," pp. 31, 32.

An egg of the wheel animalcules is often matured in twenty-four hours. Ehrenberg made the following interesting observation, in reference to the largest species of this kind, in which the time required to develop the eggs is much greater than in many others:—"On November 21st, I placed in a jar a young hydatina, containing an egg nearly mature. I added for its food a drop of a liquor containing monads. On the morning of the 22nd the egg had been deposited. On the 23rd, I met with four individuals, of which two were fully developed. On the morning of the 24th there were twenty. The observation ceased at this point, as it became too difficult to count the numbers which thus rapidly increased. In a space of seventy-two hours twenty individuals had been formed, one only having been employed as the stock; and at this rate of increase the numbers would be, at the end of ten days, 1,048,576; and this number would be quadrupled in another day. If only two instead of four, the usual number, were produced daily by each individual, a million would be called into existence in twenty days; and on the twenty-fourth day we should have 16,777,216 animalcules."

Infusoria appear wherever decaying animal or vegetable substances are found in water, and are no doubt useful as scavengers of creation, destroying what would otherwise taint the air, and produce disease. They serve also for food to animals higher in the scale of creation than themselves, who in their turn support the existence of others. Thus all creation is linked together by a chain of mutual dependencies, and we know not how greatly the loss of any particular kind might be felt. Sir James Ross, in his "Antarctic Voyage," speaking of a small fish found by him in the South Seas, and stating by what means it and many others are fed, says, "All are eventually nourished and sustained by the minute infusorial animalcules, which we find filling the ocean with an inconceivable multitude of the minutest forms of organic life."

A green, slimy substance grew some years ago on the stagnant waters of a meadow above the wire factory at Schwartzenberg, in the Erzgebirge, and, when the water was slowly let off, deposited itself on the grass, dried, became quite colourless, and might then be removed in large pieces. The outside of this natural production resembled soft, dressed glove-leather, or fine paper; it was shining, smooth to the touch, and of the toughness of common paper, when unsized. On the inner side, which was in contact with the water, it had a lively green colour, and green leaves were distinguishable, which formed the leather-like pellicle.

On this substance being submitted by Ehrenberg to microscopic examination, he found it to consist most distinctly of *confervæ*, forming together a compact felt, bleached by the sun on the upper surface, and including some fallen tree leaves and some blades of grass. But among these *confervæ* were lying scattered a number of siliceous *infusoria*, including sixteen different sorts, belonging to six genera, besides three sorts of *infusoria* with membranous shields, and dried specimens of another kind.

No one who visits the county of Kent can fail to observe the extension of the great chalk range, which again shows itself on the opposite coast of Boulogne. Above the chalk lies a deep bed of plastic clay, and above this the London clay, of which the hills of the Isle of Sheppey consist, and also Shooter's

Hill, which is about four hundred and forty feet in height. Near Pegwell Bay, which is a pleasant walk from Ramsgate, this London clay immediately covers the chalk, spreading over a tract of no great extent. In some parts, as, for example, a strip from the valley of the Darent to below Gravesend, the overlying clays have been more or less completely washed away, the chalk being covered with a mixture of sand and vegetable soil.

Of the thickness of the chalk some idea may be formed from the cliffs which abruptly crop out and overhang the sea, or the estuary of the Thames. Let those who gaze with interest on the ocean dashing against the sea-wall of Dover, attentively observe its range of cliffs. The hill on which its castle stands and other relics of high antiquity, as the first pharos built here by the Romans, is four hundred and sixty-nine feet in height. Such is the measurement of the outcropping cliff; but the actual thickness of the stratum of chalk is considerably more. The late Sir W. De la Beche estimated its average thickness at seven hundred feet. Dr. Conybeare considers it to range between six hundred and one thousand feet.

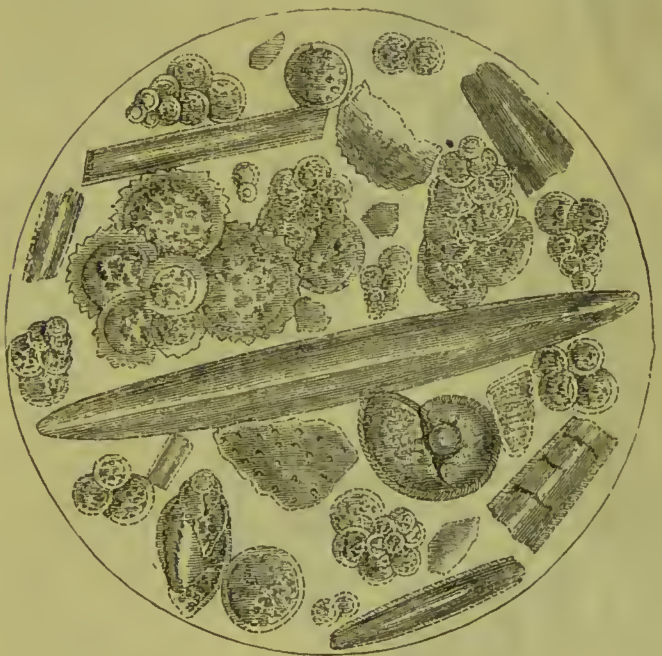
SILICEOUS MICROSCOPIC ANIMALCULES.

Original local causes influencing the deposition of the chalk, and others which have since operated, producing the abrasion or removal of its upper surface, have led to the varying of it in thickness in different places. The height of the cliff at Beachy Head, Sussex, which at the summit includes a portion of the flinty chalk, and goes down very nearly to the next stratum, the upper green sand, is only five hundred and thirty-five feet; this flinty section averages at Dover three hundred and fifty feet. Taking this as an average standard, the total thickness of the chalk on the Sussex coast may be estimated at about eight hundred feet. At Diss, in Norfolk, on the other hand, the thickness of the chalk, as ascertained by boring, is but five hundred and ten feet.

The extreme minuteness of the chalk animalcules is strikingly proved by the fact, that even in the finest levigated whiting multitudes of them are still present, and may be applied, without suffering change, to the most varied purposes. Thus, in the chalk coating given to painted chambers, paper, or even glazed visiting cards, may be seen a pretty mosaic of well-preserved moss-coral animalcules, invisible to the naked eye. Our natural vision receives from such a surface the impression of the purest white; it is only the microscope that can disclose the fact that it contains the bodies of millions of beings, of exceedingly varied and beautiful forms, that once enjoyed life.

Similar relics are found in the series of the oolite and lias rocks, which come under the chalk, and, in England and many other countries, overlie the new red sandstone.

The size of one of these animalcules amounts, on an average, and in the greater part, to $\frac{1}{288}$th of a line, which equals one-sixth of the thickness of a human hair. The globule of the human blood is not much smaller. Those of a frog are twice as large as one of these creatures. As the polishing slate has no cavities, these animalcules lie closely compressed. A cubic inch would contain, on an average, about 41,000 millions of these animals. Of the 41,000 millions of them, 187 millions go to a grain. A single shield of the *gallionella* weighs about $\frac{1}{187}$ millionth part of a grain.



ANIMALCULES IN CHALK FORMATIONS AT GRAVESEND.

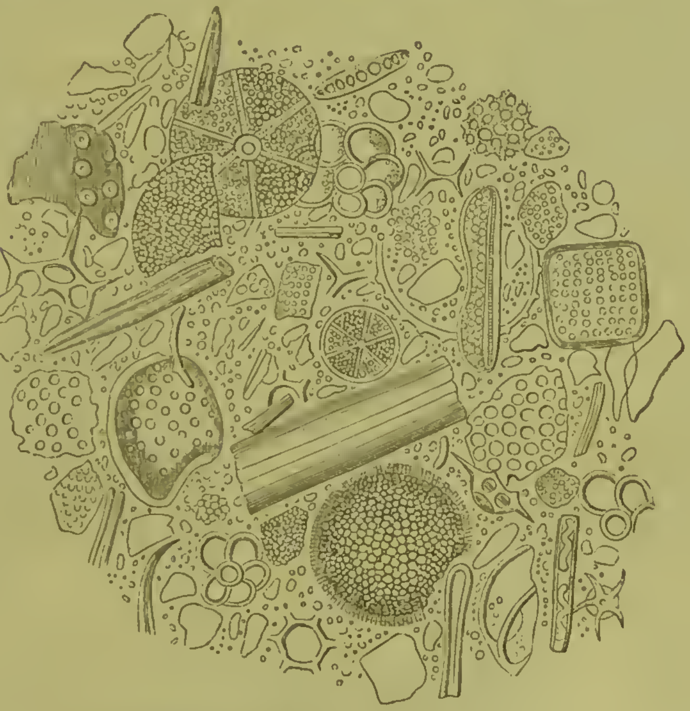
An ingenious device has been adopted by a modern writer to cast light on immense numbers, of which it is ordinarily so difficult to conceive. He says, if a million of peas were placed on the floor of a room, it would require to be sixteen feet square. Accordingly, it would require 187 rooms proportionately smaller, to contain the animalcules that would amount in weight to a single grain.

Ehrenberg has found animalcules in very out of the way places, besides flint stone; and some with iron skeletons. In the shops of the Lowther Arcade, and elsewhere, for instance, you will occasionally find pretty little ornaments, such as brooches, chains, aigrettes, and so forth, made of iron—*Berlin* iron castings, as they are termed. The iron of which these ornaments are made is stated by Ehrenberg to be nothing more or less than the skeletons of certain animalcules, having iron mixed with gelatine, to hold the carbonate and phosphate of lime together. Just as our bones are made up of carbonate and phosphate of lime, so the bones, or rather shells, of the little beings indicated by Ehrenberg as yielding the Berlin iron castings, are chiefly composed of iron.

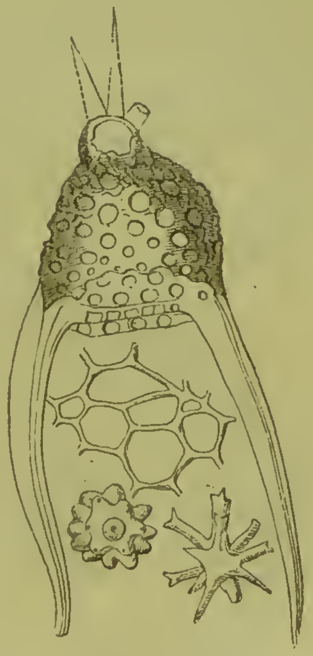
An engraving represents the animalcules which are found in our own chalk formations at Gravesend. Some of these chalk animalcules are very curiously formed. They look almost like snails. Is it to be thought that God must necessarily lavish the beauty of form and structure on large animals? On the contrary, the smallest dot of a microscopic animalcule is equally an object of care and solicitude to our great Creator. But there are forms still more elaborate amongst these dead mineral animalcules. Another engraving shows the appearance seen on examining some marl from the Ægina, under the microscopic field; and two other drawings represent two different members of the animalcules there represented, still more strongly magnified. Strange as is the appearance of the animalcules which are found in our own chalk hills, and in the Ægean marl, yet those found in certain chalk formations of Syria are still more strange, as by the accompanying diagram may be perceived.

Animalcules hitherto treated of have been dead, but others still live. An engraving, for example, contains a representation of some living animalcules found under the soil of Berlin. The hones on which our knives and other cutting instruments are sharpened, and which we call Turkey stone, is merely a mass of the fossil coverings of these creatures. Tripoli, or polishing powder, which has long been well known in the arts, is another form in which they appear; and at every stroke which is made with it, several millions, perhaps a hundred millions, of perfect fossils, fossils of these animals, are crushed to atoms.

In various parts of the world, the inhabitants are accustomed to eat certain kinds of earth and clay. Travellers had long wondered at this strange taste, and had set it down as a mere depraved appetite—taking it for granted that no nourishment could be extracted from articles of food so strange; when Ehrenberg, directing his microscope upon some of the edible clays, threw a new light on the subject. Some kinds of clay most probably contain no nourishment, and merely appease hunger for a time, by justifying the old adage, which says, "What won't fatten will fill up;" but other kinds of edible earths or clays really contain nutritious matter. Of this kind is the Luneberg mountain meal, which, being examined by the microscope, is found to contain the dead bodies of animalcules. By far the greater number are shaped like ladders, while a few resemble eggs. Each of the ladder-like objects represents an animalcule called *Sinidia acuta.* Each of the egg-formed bodies represents one called *gallionella;* and besides these, another animalcule very frequently occurs—it is called *Xanthidium furcatum.*



ANIMALCULES IN MARL ROCK FROM THE ÆGINA.



HALIOMMA SOL.

XANTHIDIUM FURCATUM.

It is not often that the bodies of microscopic beings exist in sufficient numbers and remain in such preservation that they admit of being used as food; but the general presence of minute creatures, sometimes dead, at other times living in various minerals, where we little dream of their existence, is most extraordinary. Thus chalk-rocks, for example, swarm with animalcules; probably, indeed, chalk-rocks are nothing more than one vast graveyard of minute animals long since dead, their skeletons only remaining.

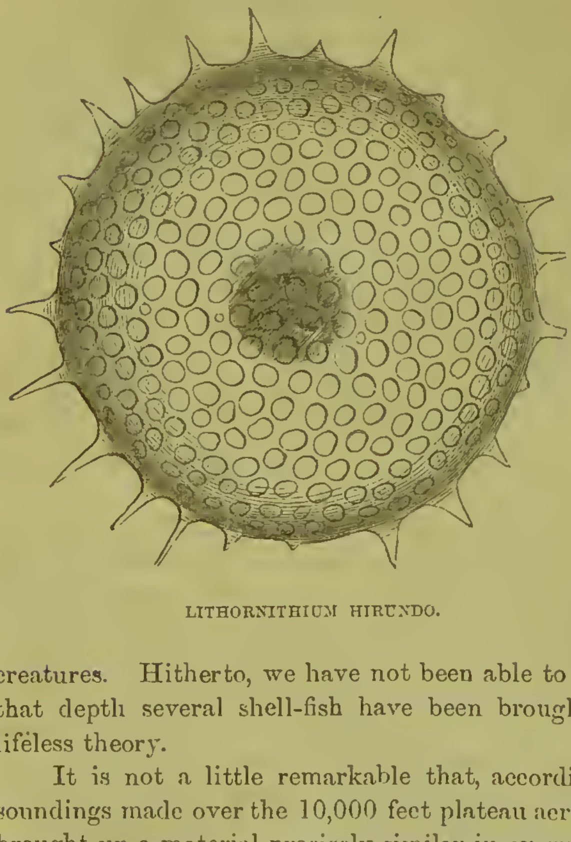
In Bohemia there is a stratum of two miles in length, and on an average of twenty-eight feet in thickness, the uppermost ten feet of which are composed wholly of the siliceous shells of animalcules, while the remaining eighteen feet consist of the same shells mixed with a pulverulent substance. In many other parts of the world corresponding deposits have been found, some containing marine, some fresh-water species.

The town of Richmond, in Virginia, in the United States, is built upon a barren stratum of this description, the shells of which are of marine origin. Sometimes such strata are found beneath peat bogs many feet in thickness, and forming a siliceous marl of a pure whiteness.

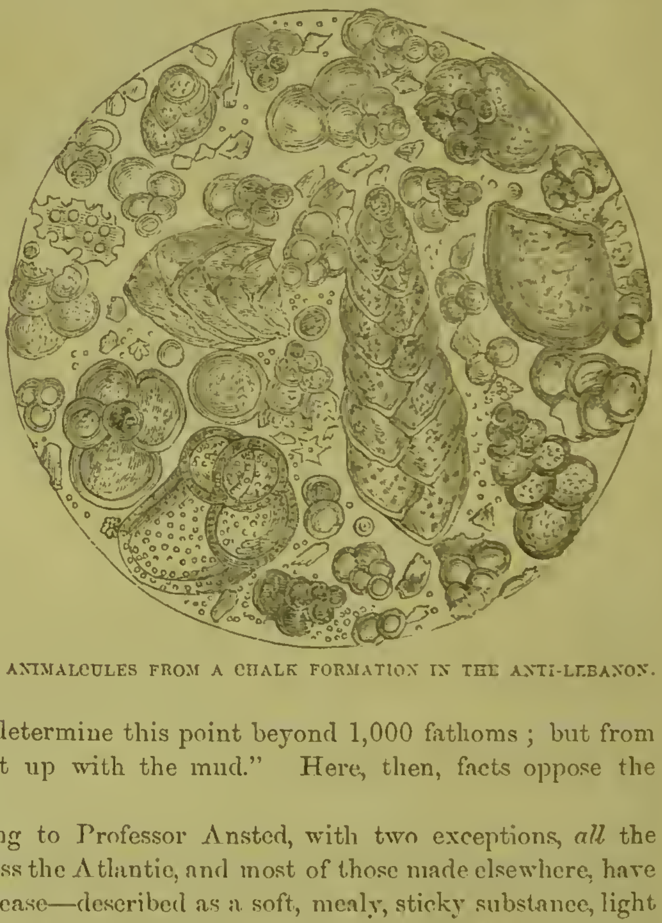
Existing species have been detected as low down as the oolite formation. Ehrenberg discovered in the chalk-marls more than twenty which are identical with some now living in the Baltic. Inferior as they are in individual energy to lions and elephants, they are, in their united influences, far more important than all these animals. It is curious to think that the tiara of the empress is indebted for its splendour, and the wheat-stem for the glazing that preserves it from the mildew, to the existence, long ages back, of minute living creatures, whose being was not even suspected a quarter of a century ago.

It has often been asserted that the natural conditions which prevail at great depths of the ocean are incompatible with the maintenance of animal life. Thus it has been said that water at the depth of 1,000 feet is, according to experiment, compressed to $\frac{1}{340}$ of its own bulk, and at lower depths the compression would be proportionately greater; and there, also, sand, mud, and all loose *débris*, would be compressed and consolidated.

But in Sir James Ross's "Voyage to the Antarctic Regions," between the years 1839 and 1843, we read: "Contrary to the general belief of naturalists, I have no doubt that from however great a depth we may be enabled to bring up the mud and stones of the bed of the ocean, we shall find them teeming with animal life; the extreme pressure at the greatest depth does not appear to affect these creatures. Hitherto, we have not been able to determine this point beyond 1,000 fathoms; but from that depth several shell-fish have been brought up with the mud." Here, then, facts oppose the lifeless theory.



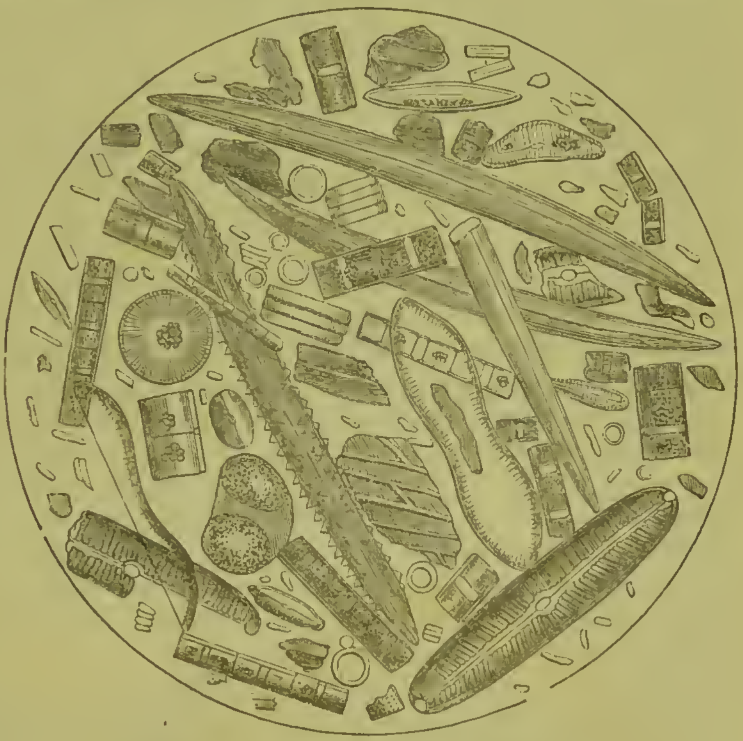
LITHORNITHIUM HIRUNDO.

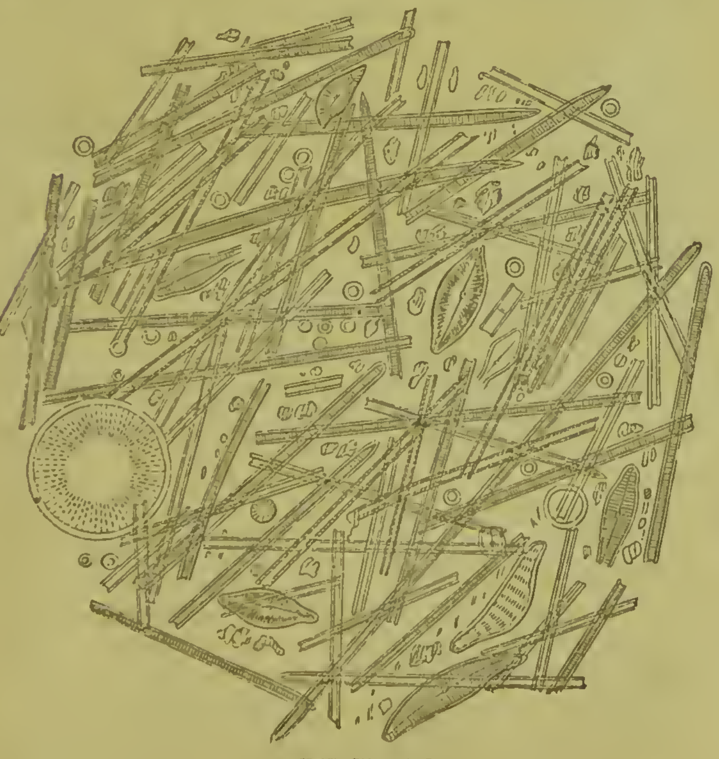


ANIMALCULES FROM A CHALK FORMATION IN THE ANTI-LEBANON.

It is not a little remarkable that, according to Professor Ansted, with two exceptions, *all* the soundings made over the 10,000 feet plateau across the Atlantic, and most of those made elsewhere, have brought up a material precisely similar in every case—described as a soft, mealy, sticky substance, light coloured, and mud-like, called by the surveyors "oaze." On minute examination this was found to be an impalpable powder, with a mixture of slight grittiness, the powder composed of carbonate of lime, nine-tenths by weight of the whole mass, consisting of very minute animal organisms, and the gritty particles (not much more than five per cent. by weight of the whole) being angular fragments of some hard mineral. The remaining small proportion includes flinty skeletons of animals and vegetables. These results in themselves are singular enough, but it is still more remarkable that everywhere these animal organisms seem to have belonged almost exclusively to varieties of one species, whose microscopic skeleton has been distributed, in inconceivable numbers, over a million of square miles of ocean floor.

The animals to which these skeletons once belonged are referred to a group showing the smallest amount of organisation. Simple, however, as they are, in point of mechanical contrivance, the great mystery of life is not less wonderful in them than in the structure of the largest quadruped, or of man himself; and the little deposits of carbonate of lime they accumulate, to inclose or cover the bag or cell of jelly-like matter of which they are composed, is as regular and well-adapted to the creature as any skeleton, carapace, or shell ever constructed. Conceive a creature, ten thousand of whose fellows might disport themselves with ease in the drop of water that would rest on a small pin's head, a mere lump of jelly, capable of assuming any form whatever, and actually doubling itself, and becoming a temporary stomach, whenever an atom of food happens to present itself. Imagine this creature vaguely extending filaments, like very fine rootlets, in every direction, and drawing them back when it pleases, to form with them parts of a new stomach; conceive, also, a number of these combining together, each acting the part of a separate individual, but all having one common substance—each, notwithstanding its present simplicity of structure, endowed with the power of separating particles of carbonate of lime or silica from sea-water—a faculty with which not every chemist is gifted—and building with this carbonate of lime or silica a kind of coat, a *carapace*, or skeleton. In a group of such individuals all are so closely connected as to form apparently one mass; but each builds for himself a construction of the same kind, until at length there is obtained a complicated, many-chambered shell, not much unlike that of a nautilus, only infinitely smaller, which remains a permanent monument, enduring for ages, long after the larger races have died out, and been destroyed. Such animals may, as they do now at the bottom of the Atlantic, afford the only proofs of animal existence over areas thousands of square miles in extent, although in the waters above there may have floated innumerable fishes, and other animals far higher in the scale of existence.*


ANIMALCULES FOUND UNDER THE SOIL OF BERLIN.


MOUNTAIN MEAL.

Dr. G. C. Wallich, however, contends, still more recently, that creatures of a much higher order than animalcules may be brought up from great depths of the ocean. Thus, he obtained from the depth of nearly a mile and a half

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* Ansted's "Geological Gossip."

(1,260 fathoms) sea-stars (*Ophiocomæ*), which were not only alive when they emerged from the sea, but continued to move their rays for nearly a quarter of an hour afterwards.

"This sounding," says Dr. Wallich, "far exceeds in importance any previous sounding on record; for not only does it for ever determine the fact that animal existence may be maintained at depths vastly greater than by most persons has been believed possible, but it proves the fallacy of several of the conditions which have heretofore been supposed to limit the bathymetrical distribution of animal life, and points to the existence of a new series of creatures peopling the deeper abysses of the ocean, and destined, perhaps, to furnish many of the missing links between the submarine faunas of the past and present. That single sounding, I may be permitted to say, compensates for every disappointment that weather and accident may previously have engendered. At the eleventh hour, and under circumstances the most unfavourable for searching out its secrets, the deep has sent forth the long-coveted message. What mechanical ingenuity failed to achieve, hunger or curiosity accomplished; and thus, whilst the sounding apparatus only succeeded in bringing up from a depth of 1,260 fathoms a number of minute shell-covered creatures, so simply organised as to render them incapable of perceiving or escaping a danger, thirteen star-fishes, ranging in diameter from two to five inches, came up, convulsively embracing a portion of the sounding-line which had been paid out in excess of the already ascertained depth, and rested for a sufficient period at the bottom to permit of their attaching themselves to it. These star-fishes arrived at the surface in a living condition, and, what is still more extraordinary, continued to move their long, spine-covered rays for a quarter of an hour afterwards; clearly proving that, if their adherence to the sounding-line was due, in the early stage of their progress upwards, to a clonic spasm of the muscular tissue, neither life nor previous energy ceased, till after the lapse of the period mentioned." *

And now, in concluding our work, "it is not out of place to remark, that it is the very perfection of the Divine workmanship which leads every inquirer to imagine a surpassing worth, and grace, and dignity in his own special department of it. The fact is altogether notorious, that, in order to attain a high sense of the importance of any science, and of the worth and beauty of the objects it embraces, nothing more is necessary than the intent and perfect study of them. Whatever the walk of philosophy may be on which man shall enter, that is the walk which of all others he conceives to be most enriched by all that is fitted to entertain the intellect or arrest the admiration of the enamoured scholar.

"The astronomer who can unravel the mechanism of the heavens—the chemist who can trace the atomic processes of matter upon earth—or the metaphysician who can assign the laws of human thought—or the grammarian who can discriminate the niceties of language—or the naturalist who can classify the flowers, and the birds, and the shells, and the minerals, and the insects which so teem and multiply in this world of wonders;—each of these respective inquirers is apt to become the worshipper of his own theme, and to look with a sort of indifference, bordering on contempt, towards what he imagines the far less interesting track of his fellow-labourers. Now, each is right in the admiration he renders to the grace and grandeur of that field which he himself has explored; but all are wrong in the distaste they feel, or, rather, in the disregard they cast on the other fields which they have never entered. We should take the testimony of each to the worth of that which he does know; and then the unavoidable inference is—that that must be, indeed, a replete and a gorgeous universe in which we dwell, and still more glorious the Eternal Mind, from whose conception it arose, and whose prolific fiat gave birth to it, in all its vastness and variety!"

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* "The North Atlantic Sea-bed." Van Voorst.

THE END.

SCIENTIFIC TABLE.

◆

It having been found convenient in this Volume to deviate from a strictly scientific arrangement, the following Table (which, having regard to our space, we prefer to substitute for the accentuated Table, to which reference was made in an earlier Volume) has been prepared, and will be found an accurate classification, according to the best authorities. In this Table some few typographical errors, which have crept into this volume, have been corrected.

o. Order ; § Section ; *f.* Family ; *gr.* Group ; *g.* Genus ; *s.* Species.

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g.	—— vorticella	326
f.	*Enchelia*	327
s.	—— enchelys pupa	*ib.*
g.	—— leucophrys	333
f.	*Kolpoda.*	
s.	—— paramecium aurelia	326
INFUSORIA LORICATA (*clothed, or shelled*).		
f.	*Peridina.*	
s.	—— gonium pectorale	333
s.	—— ,, pulvinatum	*ib.*
s.	—— volvox globator	*ib.*
DESMIDIEÆ		331
g.	*Desmidium*	*ib.*
s.	—— desmidium quadrangulatum	*ib.*
g.	*Micrasterias*	*ib.*
s.	—— micrasterias denticulata	*ib.*
g.	*Euastrum*	*ib.*
s.	—— euastrum oblongum	*ib.*
g.	*Cosmarium*	*ib.*
s.	—— cosmarium margaritiferum	*ib.*
g.	*Xanthidium*	327
s.	—— xanthidium furcatum	*ib.*
g.	*Arthrodesmus*	331
s.	—— arthrodesmus convergens	*ib.*
g.	*Closterium*	*ib.*
s.	—— closterium accrosum	*ib.*
s.	—— ,, monoliferum	*ib.*
s.	—— ,, Dianæ	*ib.*
s.	—— ,, setaceum	*ib.*
g.	*Spirotænia*	*ib.*
g.	*Ankistrodesmus*	332
s.	—— ankistrodesmus falcatus	331
g.	*Pediastrum*	332
g.	*Scenedesmus*	*ib.*
DIATOMACEÆ.		
g.	*Navicula*	332
g.	*Bacillaria*	*ib.*
g.	*Gallionella*	332
s.	—— gallionella ferruginia	*ib.*
ROTIFERA NUDA.		
f.	*Hydatina.*	
s.	—— notommata clavulata	329
ROTIFERA LORICATA.		
f.	*Brachionæa*	*ib.*
s.	—— brachionus urceolaris	*ib.*

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ERRATA.

Page 162, *for* "Pencallia Syngaria," *read* "Pericallia Syringaria." The words "Abraxas" and "Bætica" are incorrectly placed, and should be omitted.

Page 169, line 13 from foot, *for* "In the beetle the upper jaws are soft," *read* "The lower jaws are usually soft," &c.

Page 171, line 20 from top, *for* "from sixteen to twenty-eight feet, by which they usually hang," *read* "from seven to twenty-four feet, by some of which," &c.

Page 179, line 16 from top, *after* "anterior," *insert* "two recurvated and dentated horns."

Page 186, in the title of the third engraving, *for* "Root beetle," *read* "Rove beetle."

Page 192.—The engraving denominated "*Tenebrio molitor*" is incorrect. The engraving is a magnified representation of '*Chelifer cancroides*."

Page 194, beneath the engraving, *for* "*Curculio colon*," *read* "*Curculio imperialis*."

Page 198, line 12 from foot, *for* "Nerve-winged," *read* "Straight-winged."

Page 249.—An engraving of the Lappet Moth has been accidentally substituted for that of "A gall on a leaf," to which it bears some resemblance.